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NEW POWER IS NEEDED

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Railway
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April - 1934

Progressive Repairing of Gondola Cars*

By J. W. Steck†

Description of system used by New York Central at the Avis shops

PRIOR to the inauguration of the present system of repairing open-top equipment, which, with certain modifications, has been in effect on the New York Central at Avis, Pa., since 1928, considerable study was given to different methods of repairing cars and, after careful consideration, it was decided that the progressive system offered the greatest possibilities. After using this system for more than five years in the repairing of all types of open-top equipment, receiving all classes of repairs, it is felt that the choice was a wise one as a substantial saving has been made in labor costs and this saving has not been effected at the expense of the earning capacity of the workmen. Material costs have also been substantially reduced, with the turn-over exceptionally fast.

Interior view of jack frame equipped with special facilities for straightening cars before they are stripped

The progressive system is just what the name implies. The cars are moved at different intervals during the day, depending upon production. It requires approximately 2½ min. to complete a moving, this time in many cases being utilized by the workmen in preparing for the next car. All cars on the entire track are moved as a unit by the use of an electric winch located at the head end of the track and is effected by the use of cables equipped with special hooks.

For the successful operation of the progressive system a complete knowledge of the condition of the equipment to be repaired must be had, it not being sufficient to know what the major items of repairs consist of, but the minor repairs as well, for without this information it would be impossible to determine accurately where the different operations should be performed in the most economical manner and how many men will be required in the different positions.

For open-shop equipment receiving heavy repairs, such as new floor system, side or complete new tops, two adjacent tracks running the entire length of the shop are used. This permits a sufficient number of positions on each track and eliminates the possibility of confusion by placing too many men in any one position and also permits the different operations to be performed in the most economical manner. As an illustration, it has been found that it is far more satisfactory to apply the floor in one position and ream in another than to combine both operations in one position.

General Description of the Car Shop

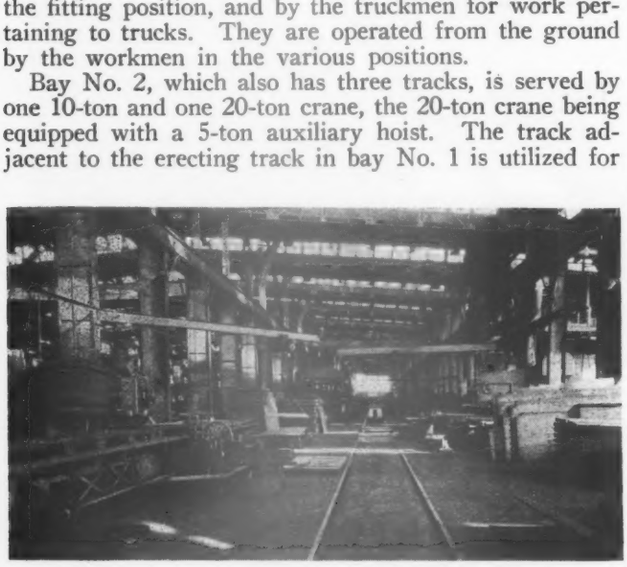
This shop, while not primarily designed for handling cars on the progressive system, is well suited for this method of repairing. The shop is 200 ft. wide by 700 ft. long, the entire floor area being covered with a wood-block floor, and consists of four bays, each bay being 50 ft. wide with three tracks running the entire length of the two principal bays.

Bay No. 1 is utilized for the repairing of cars and the storing of materials for the particular group of cars being repaired. The outside track is kept open at all

* Paper presented before the meeting of the Eastern Car Foremen's Association on January 29.
† Shop superintendent, Avis, Pa.

times for supplying material. The middle track is used for the storing of material opposite each position for use on cars being repaired on adjacent tracks. This bay is served by one 10-ton traveling crane and several small electric cranes operating on independent runways. These small cranes are used by the workmen for handling heavy materials, such as floors and side sheets in the fitting position, and by the truckmen for work pertaining to trucks. They are operated from the ground by the workmen in the various positions.

Bay No. 2, which also has three tracks, is served by one 10-ton and one 20-ton crane, the 20-ton crane being equipped with a 5-ton auxiliary hoist. The track adjacent to the erecting track in bay No. 1 is utilized for



Fabricating shop from west end showing completeness of equipment

cars receiving heavy repairs. A portion of the middle track is utilized for the placing of cars for scrap loading, while the third track in this bay is used for the repairing of cars by the progressive system receiving miscellaneous repairs, all work being completed on the one track.

The fabricating shop is located, in the west end of bay No. 3 the east end of the bay being utilized for storing material requiring fabrication. This bay is served by one 20-ton crane and, in addition, each principal machine is equipped with an electric hoist.

Bay No. 4 contains the planing mill, electric, air-brake and tool rooms. This bay is also used for repairing cabooses in the east end and, in the west end, gap riveting of car parts, such as doors, longitudinal hoods, tie bars, etc., a class of work which can be more economically performed by this method than by the use of an air hammer.

West of the car shop, separated by the transfer table, is located the wheel shop and the blacksmith shop. At the east end is located the classification yard with a capacity of 260 cars, the jack frame, and the paint shop.

As the cars are shopped in the train yard they are inspected and classified as to the repairs required. This information is furnished to the office and from records maintained the total number of each group of cars and the repairs required can be ascertained.

When instructions are received as to the group of cars which are scheduled for repairs, an actual inspection is made of a representative number to determine the material required. This information is then furnished the stores department who prepare requisitions covering the necessary material. The delivery dates on material requiring fabrication are so specified that the shop will have sufficient time to fabricate a portion of the material before it is required on the assembly track. The delivery dates of all other material are so specified that the material will be on hand when needed.

Material being received from the manufacturers requiring fabrication is unloaded by the stores department with the 20-ton crane and stored in the east end of bay No. 3 until such time as it may be required at the various machines. All other material not requiring fabrication is unloaded by the stores department in bay No. 1 and stored opposite the various positions where it is used.

In repairing open-top equipment the fabricating shop plays an important part in the success of the assembly track and, unless close supervision is given this department, serious trouble will be experienced in the assembly of cars. While new methods were being devised for the repairing of cars it was also essential that new methods be found for performing the different operations in the fabricating shop, and this has been effected in many cases by the proper location of the various machines, the installation of duplicators, spacing tables, special jigs and dies, and the elimination of unnecessary time in handling material from one machine to another. Approximately 80 per cent of all material entering into the repairs of the 70-ton cars now being overhauled is fabricated at the shop.

The track line-up is based on a production of 20 self-clearing hopper cars per day receiving complete new floor system, end and corner sheet reinforcements and all other necessary work on the body and trucks. It should be understood, however, that the line-up will vary according to the class of equipment being worked, the class of repairs and the production desired.

As the cars are received in the shop classification yard they are inspected to determine whether any straightening is required before the actual repairs can be started. If straightening is required, the cars are placed in the jack frame, where, by the use of special facilities operated by air such items as top, side and end angles, side

An 8-ton gas-electric truck with special platform transports material for positions 6 and 7

and end sills, side stakes, etc., can be straightened cold without being removed from the car.

By the use of this jack frame and other facilities an average of 10 hopper cars can be straightened in eight hours.

Four Positions Used for Stripping

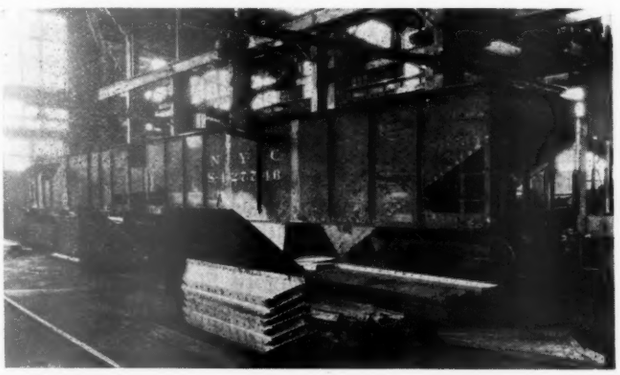
After the cars are straightened they are placed in the east end of the shop where the dope is pulled from the boxes, doors are opened and all dirt and rust removed that would interfere with the ripping of the floor by acetylene-burning outfits preparatory to removal. As the cars are required in the shop they are moved in by an electric winch located outside the shop.

In repairing cars 13 positions are required to perform all the different operations, seven of them being in bay No. 2 and six in bay No. 1 with two cars in each position. The illustrations show the cars at the start of the

work in that position rather than when the work is completed.

In the first position the cars are raised with the 20-ton overhead crane and placed on car horses. The cars are inspected and all defective parts marked for removal; the floors are ripped by the use of acetylene-burning outfits preparatory to removal; all defective parts, such as center plates, buffer castings, draft stops, brake shafts, etc., are removed, and the couplers and gears are dropped for inspection. All O. K. material—including train line—removed on account of other repairs is delivered to bay No. 1 where it is reapplied. All scrap material from this position is loaded in scrap boxes which are emptied by the overhead crane as required. After the work assigned to this position has been completed, the cars are replaced on their own trucks where they remain until the car reaches the truck position.

In the second position all rivets holding the floor to



Jib cranes supplement overhead cranes, position 7

the body of the car are removed by the use of acetylene-burning outfits equipped with special rivet-piercing tips. All other defective material, such as side stakes, sill steps and handholds are removed and parts which can be reclaimed are delivered to the blacksmith shop for repairs. In this position special trestles have been provided to eliminate unnecessary scaffolding.

In the third position the floors are removed with the overhead cranes, the scrap being loaded in cars directly opposite on the adjacent track. The scrap cars are changed each night by train crew after the shop has been closed for the day, it requiring approximately three high-side gondola cars for the scrap material accumulated from 20 cars receiving new floor systems.

In the fourth position all rivets which were not pulled out with the floor in the third position are backed out by the use of pneumatic tools.

The stripping of the car has now been completed.

Nine Positions Used for Assembling

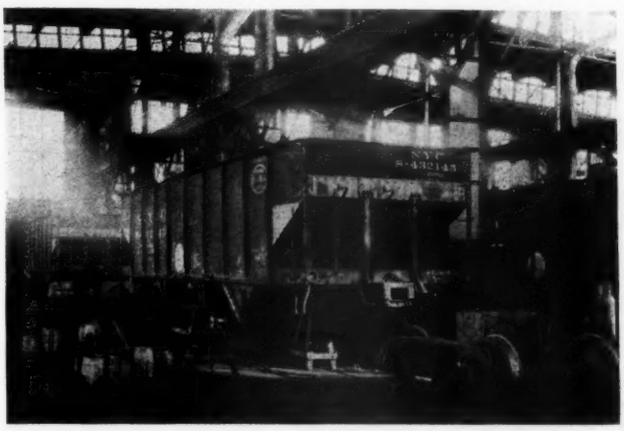
In the fifth position the interior and exterior of the car receive such cleaning as is necessary for painting when the repairs have been completed and all necessary parts of the car body are slush painted before new floors are applied. Permanent scaffolds have been erected in this position to eliminate loss of time and special facilities for the cleaning of the cars have also been provided.

In the sixth position the inside and outside hoppers, longitudinal hoods and bottom angles are applied. The hoppers are gaged with templets to insure correct door openings. The inside hoppers and longitudinal hoods are also reamed in this position to permit the riveting of these parts before the balance of the floor is applied. All material used in this position is stored on the adjacent track within easy reach.

In the seventh position, center floor sheets, gussets, side stakes and tie bars are applied with the aid of jib cranes equipped with an electric hoist located over the center of each car. The material used in this position is also stored on the adjacent track.

The cars, after the repairs have been completed in this position, are moved onto the transfer table and placed on the adjacent track in bay No. 1. In the eighth position the cars are raised by means of a small overhead electric crane operated by the workmen in this position and placed on car horses. The inside hoppers and the longitudinal hoods applied and reamed in the sixth position are driven, as well as all other miscellaneous driving, such as center plates, draft stops, buffer castings, etc. The trucks are inspected and all necessary work, including the repairing of boxes, is performed. The handling of defective truck sides, frames, bolsters and wheels is effected by the use of an overhead crane equipped with an electric hoist. After repairs have been completed the car body is placed on special car carriers fitted to the trucks, which elevate the body of the car. The cars are moved in this manner until they reach the last position on this track. These carriers avoid the necessity of raising and lowering the car in the remaining positions and make the bottom of the car easily accessible.

In the ninth position the floor sheets and angles, corner and end sheet reinforcements, inside and outside hopper reinforcements and door-shaft castings are applied.



Special carriers applied to trucks are used to elevate cars in positions 8 to 13

All material used in this position is stored on the adjacent track within easy reach of the overhead electric traveling cranes. The fitting of all car parts is effected by the use of special fitting-up bolts. To eliminate the necessity of scaffolding in the fitting, reaming and driving of end-sheet reinforcements, a special scaffold has been designed which remains on the cars until they reach the door position, by which time all the above-mentioned work has been performed.

In the tenth position the floors and reinforcements are reamed and all fitting bolts which were applied in the fitting position are changed, with the exception of those in the outside and inside hopper reinforcements and bottom angles, on which work is performed in the door position.

In the eleventh position all rivets are applied in the floor and reinforcements, except those parts not reamed in the tenth position.

In the twelfth position the doors are applied and drawn. Outside and inside hopper reinforcements and bottom angles are then fitted to the doors and reamed.

All material used in this position is also stored on the adjacent track. To eliminate confusion the cleaning and oiling of the cars is performed in this position while the balance of the air-brake work is taken care of in the last position.

In the thirteenth or last position inside the shop the cars are raised with the overhead crane and again placed on car horses. The special car carriers are removed from the trucks and returned by the overhead crane to the eighth position to be reapplied. The rivets are applied to doors, outside and inside hopper reinforcements, and bottom angles, and any defective rivets previously applied are replaced. Couplers, draft gears and brake-shaft fixtures are applied and all work pertaining to the air brakes is performed. Any necessary welding in the body of the car to eliminate the loss of lading particularly slack coal is performed in this position. After the repairs have been completed the cars receive a final inspection before painting and any work improperly performed is corrected.

After the repairs have been completed the cars are moved to the outside of the shop where they receive the first coat of paint, after which they are moved to the paint track for the second coat and stencilling.

New and Modern Air-Brake Department

For the past several months considerable study has been given to the cleaning and repairing of triple valves on a production basis. One of the illustrations shows the arrangement of the air-brake room developed to accomplish this purpose. The triple valves as they are

Triple valve repair department is well laid out and equipped

received for repairs are placed in a special bin provided for that purpose. The first operation consists of completely dismantling the valve and the cleaning and gaging of the triple-valve body. As the parts are removed from the triple valve they are placed on an endless belt which travels the entire length of the bench and is driven at a speed in direct proportion of the valves required per day, the power being furnished by an electric motor. The use of a belt for conveying the triple-valve parts from one position to another eliminates the possibility of damaging the external parts of the valve details. In the second position all parts of the triple valve are cleaned and gaged, except the body, which received attention in the first position. The cleaning and polishing of the internal parts of the triple valve is facilitated by special rotating brushes and the grinding of the check valve is effected by a special power-driven device. All parts which fail to pass the prescribed gages or are found otherwise defective are replaced by O. K. material taken from the material bins directly in front of the workmen. The parts are so placed on the belt in this position that they will be available to the workman in the next position in the order in which they are required for assembling. In the last position the triple valve is lubricated and assembled, after which it is placed on the belt and are conveyed to a special bin directly back of the test rack where the valves are available for final test on 3-T test rack. Any valve which fails to pass the test is returned to the bench where the necessary repairs are made, after which the valve is re-tested. This method of cleaning and repairing triple valves has resulted in increased production and a substantial saving in labor cost.

No attempt has been made to cover the many details which are essential to the success of the progressive system, only a general outline being given.

Radial Buffer with Friction Compression Resistance

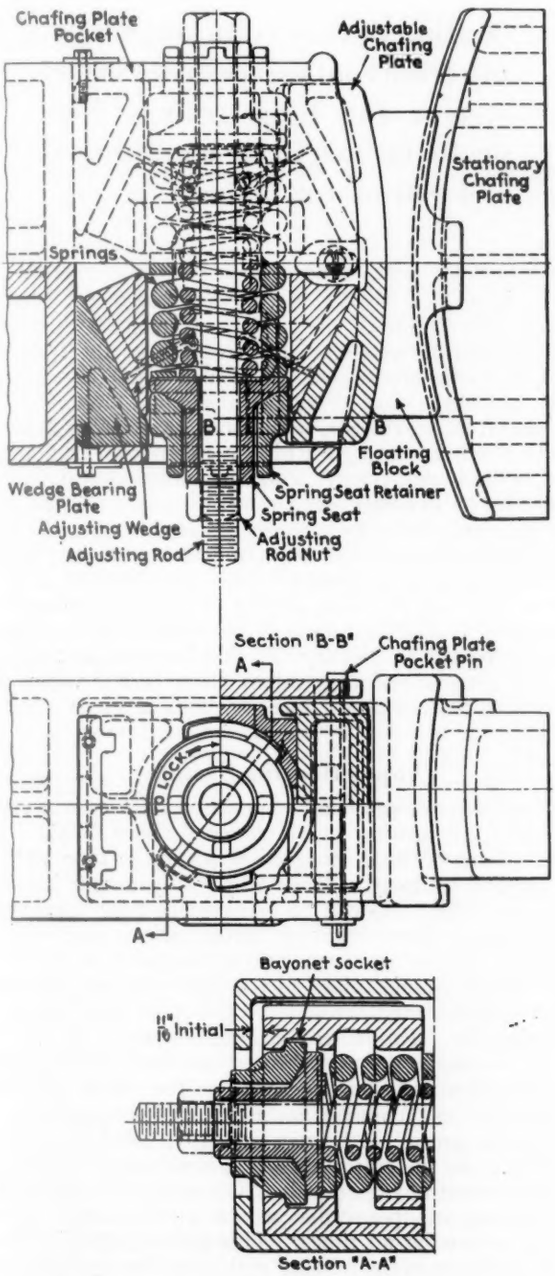
A BUFFER for service between the locomotive and tender is required to permit complete flexibility of movement between the two vehicles in passing through curves and turn-outs, as well as for side movement and rolling of the two vehicles with respect to each other. At the same time the buffer surfaces must always maintain contact. The development of lost motion subjects the drawbar and drawbar connections to destructive shocks.

The Franklin radial type buffer has for many years been the most effective means for accomplishing these ends. In this device the contact between the chafing plates, through the floating block, is maintained either by direct spring compression or by adjustable wedge behind the adjustable chafing plate on the tender. In the Franklin type E-2 radial buffer, which has recently been developed by the Franklin Railway Supply Company, New York, the same principles for universal flexibility of motion between the engine and tender have been employed, but direct spring compression behind the adjustable chafing plate has been replaced with spring-controlled frictional resistance which provides a resistance to compression of four to six times the magnitude of the forces which the unit is capable of transmitting to the drawbar connections. Thus the relatively light force tending to separate the engine and tender reduces the loads causing wear on the drawbars and pins, while interposing a resistance to compression in buffing action which may be as great as the tractive force of the locomotive. This keeps the engine-tender connection tightly laced at all times so that the inertia of the tender becomes a part of the effective inertia of the locomotive in absorbing and damping longitudinal and nosing vibrations.

The illustrations show clearly the principle on which the device is built. The tandem unit of two A. R. A. Class G springs, acting transversely on movable double-taper wedges, exerts the force which keeps the adjustable chafing plate in contact with the stationary chafing plate through the floating block. This arrangement keeps the adjustable chafing plate constantly in proper alinement, preventing cocking which resulted from the failure or weakening of one of the springs in the older arrangement. It also greatly simplifies the coupling and uncoupling of the engine and tender, as well as drawbar inspection and the inspection of the radial buffer itself.

For assembling the wedges, springs and adjustable chafing plate in the buffer pocket the two Class G springs

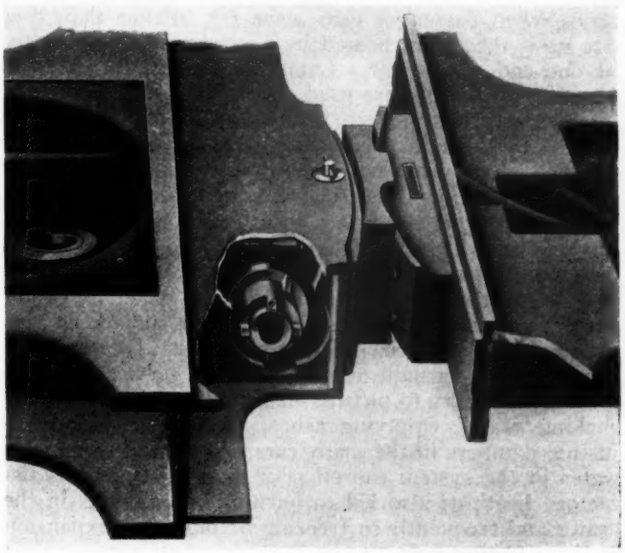
and spring seats are placed on an adjusting rod or bolt and compressed by drawing up the nut on the end of the rod. After the triangular wedge wearing plates have been placed in the back of the buffer pocket and the wedges are inserted, the adjustable chafing plate is then placed in position against the outer faces of the wedges



Plan and elevation sections of the type E-2 radial buffer

and secured in the pocket by a pin and cotter. This passes through a slot in the chafing plate which permits the latter to adjust itself freely in service. The spring and spring-seat assembly is then slipped through the side of the pocket and into the central passages in the wedges. A spring-seat retainer is next slipped over the end of the spring seat and turned to the right, causing lugs on the retainer to lock in bayonet sockets in the wedge. A similar operation at the other end of the springs completes the assembly. The removal of the nut from the adjusting rod releases the spring pressure, causing the spring seats to bear against the spring-seat retainers and thus against the wedges which tend to force the adjustable chafing plate outward.

In connecting and disconnecting the locomotive and tender the use of the adjusting rod and nut to release the wedges from the spring pressure makes it unnecessary to use another locomotive to relieve the drawbar of the buffer load and release the drawbar pins. In the



The Franklin type E-2 radial buffer

same manner the spring assembly may be removed from the buffer pocket and the wedges inspected without uncoupling the drawbar.

The friction surfaces between the adjustable chafing plate, the wedges and the wedge bearing plates are so proportioned in area and angle as to reduce wear to a minimum. When wear accumulates, however, the release of the spring pressure against the wedges by the use of the adjusting rod and nut permits the insertion of shims behind the wedge bearing plates at the rear of the buffer pocket without the removal of any of the parts. The wedge bearing plates are simply moved forward and the shims inserted behind them through slots in the ends of the buffer pocket.

The E-2 type radial buffer is applicable to existing locomotives as well as to new power. For existing locomotives a separate buffer pocket is provided which can be bolted or welded to the tender frame. In the case of new power it forms an integral part of the tender-frame casting.

RAILROAD HISTORICAL EXHIBIT.—An exhibition of historical railroad pictures and models is now in progress in the east balcony of the Grand Central terminal in New York. Sponsored by the Railway & Locomotive Historical Society, the exhibition will continue through April. The society itself makes an interesting story It is the first organization in America to devote itself to the collection, preservation and exhibition of all kinds of historical railroad material. Incorporated in 1921, with headquarters in the Baker Library, Harvard Business School, it has enjoyed steadily increasing prestige and membership. A growing collection of material is on public exhibition in the museum at the society's headquarters. Local chapters have been organized in some of the larger cities and the New York chapter, at the request of the New York Central, has loaned material and assisted in the preparation of the exhibition now in progress.

Developments in Heating Passenger-Train Cars*

By W. H. Tucker†

Outline of the evolution in heating from coal stoves to the vapor system for long trains—New problems met in air-conditioned and rail-motor trains

CAR heating, like most other features of railroad development, has undergone many changes. In early days, when passenger cars were far smaller than they are now, they were heated by an ordinary stove placed at one end of the car. Later on, as cars increased in length, two stoves were used, one at each end of the car. Today, with the modern health and safety precautions offered by the railroads, one can hardly realize the difficulties which were experienced in forcing fires on extremely cold days, the dirt from the coal and ash dust, to say nothing of the fumes from gases, another dangerous fire hazard that once existed.

A realization that better heat distribution was necessary led to the development in 1863 of Baker hot-water heaters with side-wall coils for radiation surface. Brine was used as a partial protection against freezing, but cars required constant attention both in service and during layover. Try to picture men in railroad yards today shaking grates, emptying ashes, applying coal and adjusting dampers in the many cars now in service? Low water in the system caused poor circulation or unsatisfactory heating; also led to burning out of coils in the heater and frequently to freezing of radiation, expansion tanks and other parts.

Steam Heating Adopted

About 1886 or 1887 there was a serious collision in a railroad tunnel approaching New York city. The overturning of heaters set fire to the wooden cars and passengers were killed and injured on this account. This led to the adoption of steam, which at that time was already in use on the New York Elevated lines.

As should be expected, it required a great deal of time and expense to equip yards and terminals for steam supply. Railroads and private car owners, particularly the Pullman Company, knew that something would have to be done to retain the hot-water system until adequate provisions were made for steam supply both in service and at terminating points. Steam jackets—consisting of a pipe within a pipe—were applied under the cars, steam from a train line being passed through the jackets to steam traps at low points in the pipe line. Water pipes from the heating coils inside the car were connected to the jackets under the car. The water did not mingle with steam but passed through a pipe surrounded by steam, thereby being heated through conduction.

When cars with this arrangement arrived at a terminal where steam was not available a fire could be started in the heater. Moreover, if there happened to be a steam supply failure while cars were in service, they could still be heated by starting fires in the heaters.

Duplex or double coils were offered as a substitute for steam jackets. These coils were placed inside of the heater, being constantly in use during the heating season, either with steam passing through the inside coil or fire in the heater combustion chamber around the outside coil—the one containing water.

The Pullman Company and some railroads installed "straight steam" heat during the year 1891 and it was used extensively in following years—in fact it is still used today on one of the largest railroads in this country. With this system, steam passes from the train line through globe type valves in branch pipes to side-wall coils inside the car. Steam traps and blow-off valves are placed under the car, with connections from the coils inside the car, through which condensation and steam pass to the lowest point. You can realize how difficult it would be to maintain even temperatures with this system, particularly in long trains running today. Cars at the forward end of the train might have from 150 to 170 lb. pressure in heating coils throwing off heat at 366 to 375 deg. F., while cars at rear of train may have from zero to 10 lb. pressure in the coils, giving temperatures from 212 to 240 deg. F. To improve heat regulation, all sorts of reducing valves, thermostatic valves and modulated valves were tried without a great deal of success.

Vapor Heating System

After several years of experimental work, a vapor system of car heating was introduced about 1902. This system received little recognition for some time until it was applied to many railroad and Pullman cars between 1905 and 1908. Instead of using globe-type valves and steam traps, short-circuiting cutout valves and regulators were applied to cars. Steam passes from the train line through branch pipes to the high-pressure chamber of a regulator, then through a valve port to a low-pressure chamber. From here connections are made to cutout valves inside the car, then to side-wall heating coils. Condensation and steam returns to the outlet chamber of the regulator, coming in contact with a metal expansion diaphragm in the bottom casing, or what is at times referred to as the trap portion of regulator. The hinge cover or bottom of the regulaor is made with large openings, giving an open outlet at the extreme end of the heating system at all times. This prevents the building up of pressure in the heating coils, and the constant expansion and contraction of the diaphragm opens and closes a valve in the regulator under the car, maintaining an atmospheric or vapor supply of steam at 212 deg. F. in all heating pipes, regardless of the position of car in the train or the amount of steam pressure in train line.

Other systems were introduced such as Unotherm, Thermo-Jet, combined pressure and vapor. They were applied to many cars but have been gradually removed as the length of trains and steam pressures have increased.

There are at times controversies between the railroads and Pullman Company on contract matters. Following a thorough investigation made about 1916 or 1917, meet-

*A paper presented at the February, 1934, meeting of the Eastern Car Foreman's Association.

†Eastern manager, Vapor Car Heating Company, Inc.

ings were held between railroad and Pullman officials of a certain trunk line and car heating received considerable consideration. This brought out the fact that there was not only a heavy steam loss while cars were standing in yards with supply valves open, but also showed that inside finish was being damaged by excessive heat.

Thermostatic Control

Thermostatic control was successfully introduced about 1921. At that time the most important feature was the automatic selection of a low-degree temperature during layover period. This was accomplished by tapping the air brake line and running a branch pipe to an electric air-selector switch inside the car. When air is missing or out of train line, the air portion of this switch will automatically change the electrical position of the switch and cut in the low-degree thermostat, generally set at 50 deg. F.

To determine the real value of this yard or layover control feature, tests were conducted in a railroad yard facing a lake front, when the outside temperature was 6 deg. F. above zero. The magnetic steam cut-out valves under the control of the 50-deg. thermostat were in the "open" position, admitting steam to heating coils inside of car, 23 per cent of the 24 hours. Under manual control the same valves would have been "open" 100 per cent of the time. Consider what this means in coal consumption. To maintain car temperatures between 70 and 80 deg. at a layover point (and they are frequently 90 deg. or higher) it requires between 12 and 15 lb. of coal per hour per car, whereas to maintain a 50 deg. temperature requires but 5 lb. of coal per hour per car. It was soon realized that the train service control feature should be extended and thermostats were made to regulate temperatures for either mild or extremely cold days and are now in service in thousands of cars.

Improvement in motive power brought about the development of locomotives capable of hauling trains of 18, 20 or more passenger cars. Railroads soon realized that one of the problems would be getting steam to the rear of such trains.

Early in 1927, the New York Central conducted extensive standing tests at West Albany, also road tests between Albany and Utica. Twenty coaches and 20 Pullman cars were used. All cars had 2-in. steam train line with 1½-in. end train-pipe valves, rubber hose and 1½-in. coupler heads. Hose were removed and 1½-in. metallic joints substituted so that higher pressures could be forced through the train lines. With the test gage in the locomotive cab showing between 175 and 183 lb. on a road test between Utica and Albany, it was found that the rear car of the 15-car all-Pullman train could not be properly heated. This convinced both Pullman and railroad engineers that 2-in. end valves, 2-in. metallic joints and 2-in. coupler heads would have to be applied, and at the present time there is an A. R. A. rule covering this change.

Heating Problems with Air Conditioning

The introduction of air conditioning brought out new factors that have to be considered in car heating. In air-conditioned cars the ventilating systems used in the past are in some cases retained for winter use only. Realizing the advantage of keeping deck sash and exhaust ventilators closed the entire year, and ventilating cars through the air-conditioning units, railroads and air-conditioning companies arranged for the application of small fin-type heating radiators in air-conditioning units. Blower fans drive both the fresh air from outside intake and the recirculated air through heating radiators. Instead of heating from direct radiation on the side walls of the car, heating is now through convection from overhead air-conditioning units and radiation from side wall or floor coils. It must be remembered that side wall or floor coils are absolutely necessary for proper heating in train service, also for layovers.

The changes in temperature for both cooling and heating through convection are decidedly more rapid than through direct radiation. Thermostatic control devices had to be developed for proper regulation and are in use today or being applied to nearly 1,000 cars.

To properly regulate heat in an air-conditioned car, sidewall radiation and overhead radiators in air-conditioning units should be under the control of separate thermostats. Control panels are available with necessary relays, reclosing circuit breakers, fan and seasonal switches, also fuse blocks and fan-speed resistance units, when fans with more than one speed are used. The seasonal selector switch can be operated for the desired temperature for either cooling or heating. For this selection a thermostat is placed in the circuit that actuates the relay, cutting in or out the pump and compressor or the magnetic steam-supply valve, depending entirely on control required to bring about a comfortable condition inside the car.

Controls are arranged so that it is impossible to have heat supply to overhead radiators when cooling is desired, or in other words the selection of a cooling circuit locks out the heating circuit and vice versa. Other features of control include a positive "off" setting for the magnetic steam-supply valves to overhead units when the blower fan switch is off during layover at any terminating point. This eliminates steam waste and overheating of electrical devices in the air-conditioning unit.

Heating Rail Motor Cars

Before considering the heating of light-weight, high-speed rail motor cars, it should be remembered that in the few short years that motor-driven cars have been in railroad service, drastic changes have been made in car design and engine horsepower. With each change it was found that heating was one of the many problems.

In 1922 a small demonstrating car was built in which a Baker hot-water heater with side-wall pipe coils was installed. About 1924 the New York, New Haven & Hartford placed a number of small cars equipped with hot-air heaters in service. Metal ducts were built along the side wall and floor line and the heated air was forced through the ducts by blower fans.

Realizing that rail motor service held greater possibilities, larger and more powerful cars were designed. Some of these cars consisted of engine room, mail, baggage and passenger compartments, with each compartment requiring heat supply under independent control. Improved hot-water heaters, having greater capacity had to be developed to handle split circulation in many independent coils. To increase the heating efficiency fin radiation was substituted for standard pipe. Advantages of fin radiation over standard pipe for such installations are: less space, reduction in weight, decrease in amount of water to be handled through heater, bringing about faster circulation and thereby increasing heating efficiency. This radiation is desirable in any type of railroad equipment, but should be under thermostatic control in steam service on account of the rapid temperature changes.

The next development in rail motor service covered cars with sufficient engine power to haul trailers. At first cars much lighter and smaller than standard steam rail equipment were built for this purpose, both the rail motor and trailer cars being equipped with hot-water

heaters. As this type of trailer car could be used only with rail motor cars and as numerous cars for steam rail service were in storage the continued purchase of such trailer equipment seemed inadvisable.

Car heating companies were now confronted with the problem of furnishing steam for rail motor service. Vertical-type steam boilers were in use in electric locomotives but they were entirely too large and heavy for this service. High-pressure boilers were designed to suit every service condition. They had to be made to A. S. M. E., I. C. C. and P. S. specifications, and so added considerable weight to rail motor cars.

Complete automatic controls were necessary for this service. Oil burners and water pumps were actuated by pressurestats, water-level and low-water controls. Between boiler and steam train line under the car, a main supply line pressure reducing valve was installed. Experience has proved that safety features and design of boiler make impossible accidents due to low water or any control feature.

With the advent of light-weight, high-speed rail motor trains, everything possible had to be done to reduce weight. As high-pressure steam boilers and large water-storage tanks could not be considered on account of weight, it became necessary to develop a low-pressure boiler, working under 15-lb. pressure, which did not have to be made to standard high-pressure boiler specifications. All controls are automatic and water-storage capacity has been greatly reduced by the return of condensation through traps on the ends of the heater coils.

A light-weight, high-speed, streamlined train recently placed in service is heated through hot air convection from radiators used in conjunction with the engine cooling system and automatic oil-burning hot-air generating units. Floor ducts, with necessary outlet restrictions for proper heat distribution are on both sides of the cars. The ceiling duct, through which cool air enters the car in the summer season, serves as an exhaust or recirculating duct during the heating season. This circulation is regulated through automatic dampers.

Heated air from the engine radiator is forced by blowers through ducts in the cars with flexible bellows as conductors between the cars. If sufficient heat is not delivered by the engine radiator to properly heat the cars at all times, a fire is started automatically by electric ignition in the oil-burning hot-air generating units—one on each side of the baggage compartment in the motor car. These units are also used for heating the cars in stations or yards while the engine is idle. The units are simple in design, compact and have a high radiating efficiency. They burn the same grade of distillate as is used to run the power unit; all controls are entirely automatic.

Another train development in light-weight, high-speed, streamlined design, still in the course of construction, will be heated with steam furnished by a high-pressure boiler with all the latest improvements in complete automatic control and safety. Condensation from all radiators, both in air conditioning units and side-wall coils, will be returned to a small water-storage tank under the floor of the car in which the boiler is located, by means of an entirely new automatic arrangement.

The Friction of Railway Brake Shoes*

An investigation made at Engineering Experiment Station, University of Illinois, to determine variations in friction with speed and shoe pressure on chilled iron and steel wheels

THIS investigation was undertaken in order to determine the tangential pull and the coefficient of friction produced by two kinds of brake shoes on both chilled-iron wheels and steel wheels, and to find the variations of the pull and the coefficient with speed, with pressure and with duration of application, and also their difference on the two kinds of wheels.

The shoes used were Diamond S shoes and Special Chilled shoes, the former being a cast-iron shoe with an embedded steel mesh, the latter a plain cast-iron shoe. Both types had chilled ends. The tests were made on four wheels—two chilled-iron wheels, one of which was new and the other partly worn, and two steel wheels, one new and one partly worn.

Three kinds of tests were made during the investigation; namely, Series 1, stop tests; Series 2, constant-speed tests; Series 3, 15-min. constant speed tests. In the stop tests the shoe was applied when the wheel in the testing machine had attained the desired speed, and the wheel and the attached rotating parts of the machine were brought to rest under the action of the shoe. Five such stops under identical conditions of pressure and speed constituted one test, and the series comprises 169 tests, or 845 stops. These tests simulate the conditions under which a train is brought to rest by the application of the brakes.

In the constant-speed tests the wheel of the testing machine was kept running at uniform speed by means of the testing machine engine, while the shoe was alternately applied and released, the duration of the application being 190 revolutions of the wheel (1,642 ft. travel), and of the release period 610 revolutions (5,270 ft. travel). Ten such applications constituted one test, and the series comprises 202 tests. These test conditions simulate those which prevail in bringing a train down a long grade.

The third series, the 15-min. tests, was a modification of the second. In them the shoe was continuously applied to the wheel for 15 min., the wheel being driven at uniform speed and no attempt was made to cool either the

* Abstracted from Bulletin 257 of the Engineering Experiment Station of the University of Illinois, describing tests made by Edward C. Schmidt and Herman J. Schrader in co-operation with the Association of Manufacturers of Chilled Car Wheels.

shoe or the wheel. One such application constituted a test, and the series includes 28 tests, each made under a different combination of wheel, pressure and speed. These tests were made on used chilled iron and steel test wheels only.

In the three series the range in speed and in pressure was as follows:

	Range in speed, m.p.h.	Range in pressure, lb.
Stop tests	20 to 60	2,250 to 4,500
Constant-speed tests ...	20 to 40	500 to 4,000
15-min. tests	20 to 40	1,500 to 2,500

Since the general trends in the variation of the coefficient of friction with speed, pressure, kind of shoe

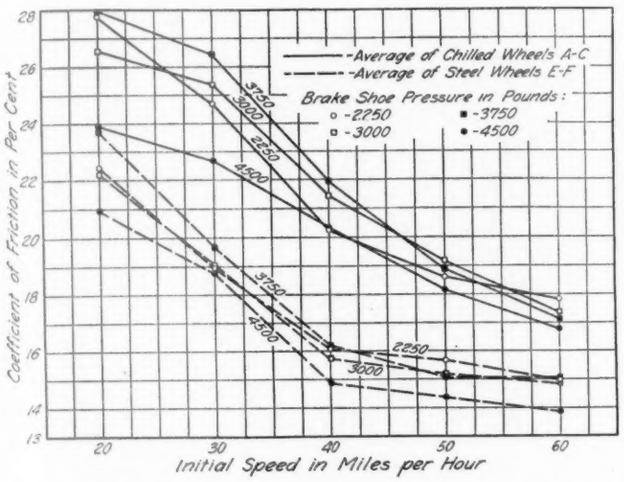

Average of Chilled Wheels A-C
Average of Steel Wheels E-F
Brake Shoe Pressure in Pounds:
○ - 2250
■ - 3750
□ - 3000
● - 4500
Coefficient of Friction in Per Cent
Initial Speed in Miles per Hour

Fig. 1—Relation between coefficient of friction and speed —Stop tests—Diamond S shoes on chilled and steel wheels

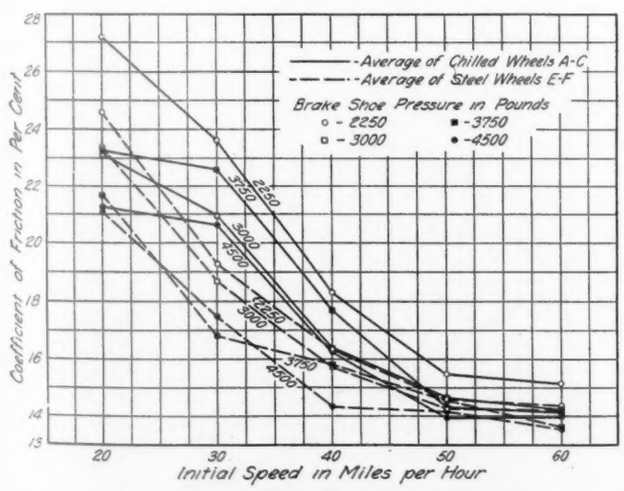

Average of Chilled Wheels A-C
Average of Steel Wheels E-F
Brake Shoe Pressure in Pounds
○ - 2250
■ - 3750
□ - 3000
● - 4500
Coefficient of Friction in Per Cent
Initial Speed in Miles per Hour

Fig. 2—Relation between coefficient of friction and speed —Stop tests—Special chilled shoes on chilled and steel wheels

and the like are similar in the stop tests and in the constant-speed tests, the results of these two series are stated together first. The results of the 15-min. tests are stated afterward.

Variation of Co-efficient of Friction with Speed.—In both the stop tests and the constant speed tests there was a marked decrease in coefficient of friction and in tangential pull as the wheel speed was increased under any given test pressure. This is true of the results produced by both kinds of shoes on all four wheels.

Variation of Coefficient of Friction with Shoe Pressure.—In both the series the pull and the coefficient decline, in general, as the shoe pressure is increased. In the stop tests the decline is somewhat irregular and less in amount than in the constant-speed tests. In the latter the decline is not only greater, but it also occurs almost invariably with both kinds of shoes and all four wheels. In the constant-speed tests the coefficient at 2,000 lb. shoe pressure was only about two-thirds as great as at 500-lb. pressure.

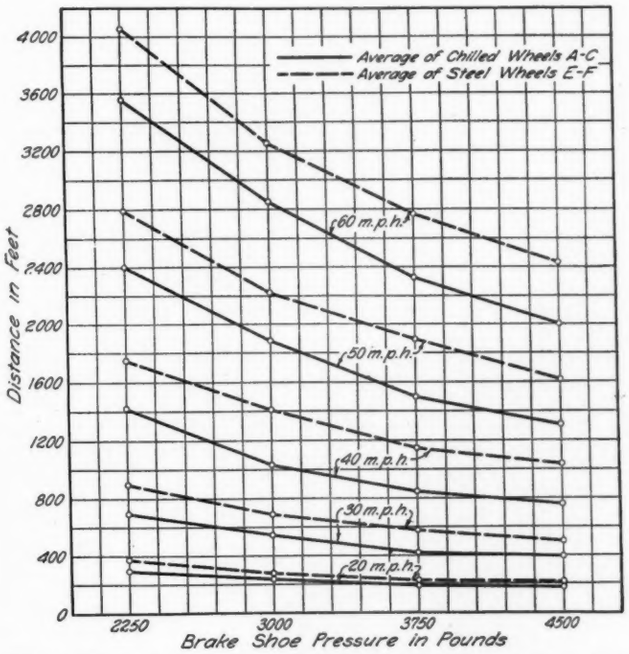


Fig. 3—Relation between stopping distance and brake shoe pressure—Stop tests—Diamond S shoes on chilled and steel wheels

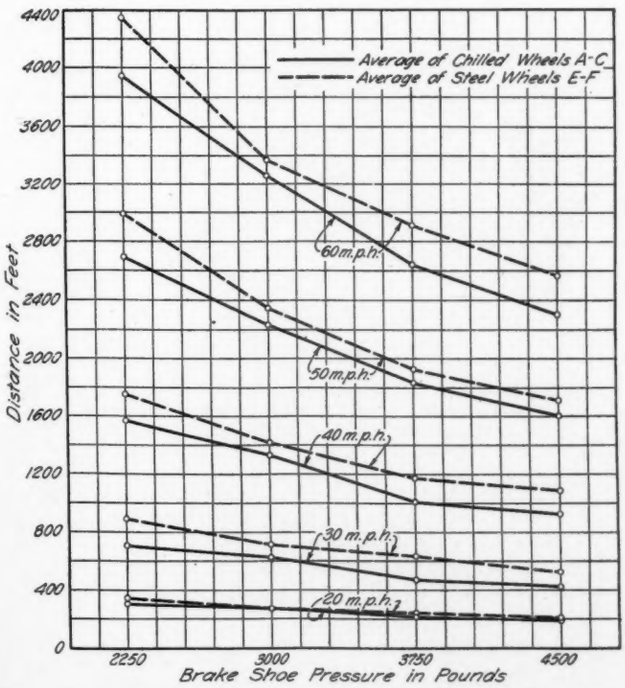


Fig. 4—Relation between stopping distance and brake shoe pressure—Stop tests—Special chilled shoes on chilled and steel wheels

Difference in Performance of Diamond S and Special Chilled Shoes.—In both the stop tests and the constant

speed tests the coefficient of friction produced by Diamond S shoes is greater than that produced by Special Chilled shoes under the same conditions of shoe pressure, speed and kind of wheel, and whatever is said of the coefficient is, of course, equally true of the tangential pull.

In the stop tests among 40 pairs of comparable average values of the coefficient there are only five pairs in which the coefficient produced by the Diamond S shoes is not greater than that produced by Special Chilled shoes, and in the constant-speed tests there is only one such exception among 30 pairs of comparable values. The excess with Diamond S shoes is frequently of notable amount, running as high as 32 per cent in the stop tests and 38 per cent in the constant-speed tests.

Difference in Brake-Shoe Performance on New Wheels and Used Wheels.—Since in Series 1 and Series 2 tests with each kind of shoes were made on each of two new wheels and on each of two used wheels, there are in each series four pairs of combinations of shoe and wheel.

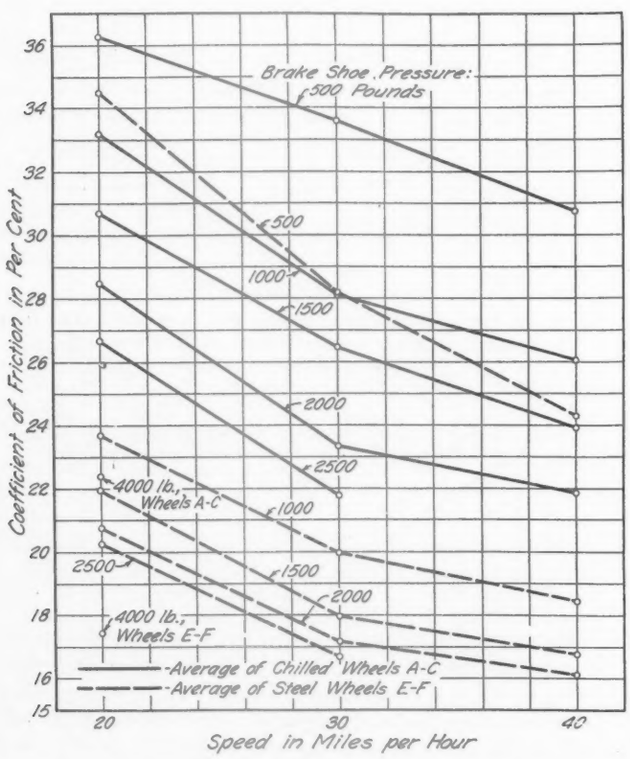


Fig. 5—Relation between coefficient of friction and speed —Constant speed tests—Diamond S brake shoes on chilled and steel wheels

In each of these pairs the only difference is that the tests in one instance were made on a new wheel and, in the other, on a used wheel.

In the stop tests in one of these pairs (Diamond S shoes on chilled wheels) the greater coefficient was produced on the new wheel, the excess over that on the used wheel being 11.2 per cent. In the three other pairs the excess occurs in tests made on the used wheels, and it ranges from 6.5 to 15.5 per cent.

In the four corresponding pairs of general average values of the coefficient produced in the constant-speed tests, the coefficient is, without exception, greater on the new wheels, the excess ranging in amount from 0.1 to 11.8 per cent. These comparisons, in both series, rest upon general average values at all speeds and all pressures. When we deal with comparable values derived under particular combinations of pressure and speed, there are exceptions to the general tendencies which have just been cited.

Difference in Brake-Shoe Performance on Chilled Wheels and Steel Wheels.—The results of both stop tests and constant-speed tests disclose a notable difference in performance on the two kinds of wheels. With exceptions so infrequent as to be practically negligible, both the coefficient of friction and the tangential pull are greater on chilled wheels than on steel wheels under identical conditions of shoe pressure and speed, with both kinds of shoes.

Dealing with average values of coefficient and pull on new and used wheels of like kind, there are in the results of the stop tests 40 pairs of comparable values of these two quantities. Among these 40 pairs there are only three in which the coefficient and pull are not greater on chilled wheels than on steel wheels, and in these three exceptions the general tendency is just barely reversed, the excesses on the steel wheels being respectively only 1.0, 1.5 and 2.0 per cent, whereas in the remaining 37 pairs of values the excess on the chilled wheels ranges from 0.1 to as much as 36.5 per cent. For the entire stop-test series the general average excess on chilled wheels is 16.7 per cent.

The results of the constant-speed tests likewise exhibit a marked superiority of coefficient and pull obtained on chilled wheels, and in this series not only is the excess somewhat greater than in the stop tests, but there are

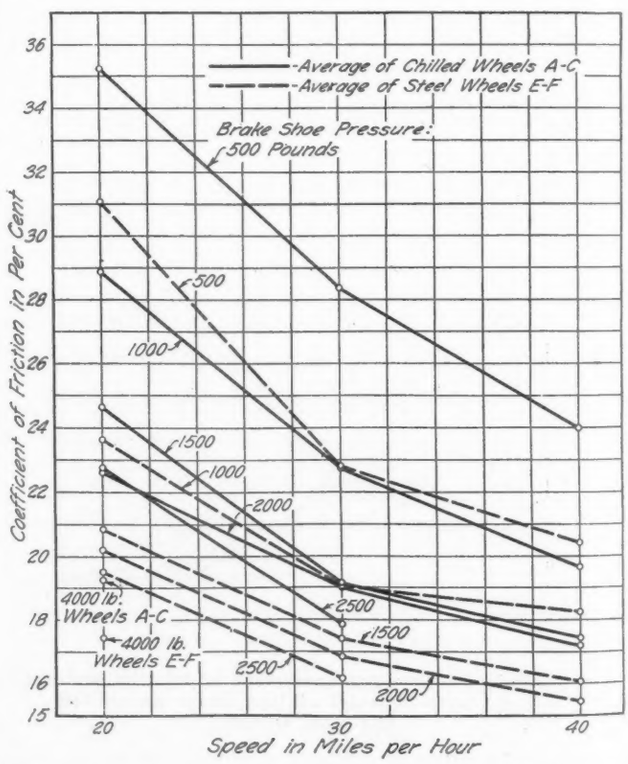


Fig. 6—Relation between coefficient of friction and speed —Constant speed tests—Special chilled shoes on chilled and steel wheels

also no exceptions whatever to the general tendency. The coefficient and pull are greater on the chilled than on the steel wheels, whether we deal with the results produced by Diamond S shoes or Special Chilled shoes, on either new wheels or used wheels. The excess ranges from 5.1 per cent to as much as 47.3 per cent. Comparing the general average values of pull and coefficient

produced during 100 constant-speed tests on chilled wheels with the corresponding average values produced in 102 tests on steel wheels, the average excess on the chilled wheels is 23.5 per cent.

Results of 15-Min. Constant-Speed Tests.—These tests were undertaken in order to try to check the validity of an opinion long prevalent among railroad men; namely, that in long-continued brake-shoe applications there is a general breakdown in the coefficient of friction. These 15-min. tests were made under some of the combinations of pressure and speed used in the constant-speed tests of the second series, and their results are directly comparable with the corresponding results of that series. The duration of the 15-min. tests was from 16 to 33 times as great as the duration of the individual applications of the constant-speed tests.

The results of these tests lend no support to the opinion just cited; they not only disclose no breakdown in the value of the coefficient of friction, but also in 24 of the 28 long-continued tests the average coefficient was greater than in the constant-speed tests run under identical pressures and speeds—by amounts which vary from 0.7 to 37.4 per cent.

Brake-Shoe Wear.—The wear of the brake shoes during the constant-speed and the 15-min. tests was determined by weighing and the loss divided by the foot-pounds of work done in order to make the results comparable. The wear thus obtained is shown in the accompanying table.

BRAKE-SHOE WEAR IN CONSTANT-SPEED TESTS AND IN 15-MIN. TESTS

Wheel	Kind of shoes	Lb. Wear per 100 Million Foot-Pounds of Work: Constant-speed tests	15-Min. tests
Chilled	Diamond S	0.346	0.396
	Special Chilled	0.497	0.649
Steel	Diamond S	0.530	0.327
	Special Chilled	0.583	0.642

It will be noted that, in general, the rate of wear is greater under the long-continued applications. This supports the inference that the increase in coefficient of friction in the 15-min. tests is caused by a softening of the brake-shoe material.

Draft Gear, Cinders, And Some Other Things*

What mechanical department can do to guard against the loss and damage to property

WHEN I talked with the Freight Loss and Damage Expert, as reported on page 425 of the December, 1933, number of the *Railway Mechanical Engineer,* he suggested that I interview a certain officer in charge of policing a railroad, for comments on how the mechanical department could be helpful in reducing the amount of loss and damage due to theft and robbery. I followed up this tip, and while it did not produce much constructive material on this particular topic, it did bring out some excellent suggestions on the broader problem of loss and damage to freight.

Theft and Robbery

"What can the mechanical department do to assist in reducing the losses from theft and robbery?" I asked.

"Not a great deal," replied the railway officer, "other than to maintain the physical condition of the cars to the highest possible standard. As a matter of fact, the losses from the cars by theft is not such a large item, particularly if we except pilferages of coal and coke, for which the mechanical department is in no wise responsible. Roughly speaking, from one-half to two-thirds of the losses due to theft occur in transit. Usually entrance to the car is gained by breaking the seal. The mechanical department is not involved in these operations, but it is concerned in such losses when freight can be removed by manipulation of door guides or fastenings, or because of defective condition of the equipment.

"If for the year 1933, for instance, we take those losses due to robbery of entire packages, or other than entire packages; add to it the concealed loss; subtract from this the losses of coal and coke by robbery; and then, to be generous in our calculations, go a step further and add one-half of all the losses of entire packages and other than entire packages, the figure will amount to approximately one million dollars. Assuming that one-half of these losses occur while the lading is in the car, the total for all of the railroads will be only a little over $500,000.

"Could the mechanical department do anything which would help to still further reduce this figure, even though it is comparatively small?" I asked.

"That department has already gone a long way in making theft and robbery from the cars difficult, by improving the door fastenings and otherwise strengthening the construction of the car, so that when properly maintained it is not an easy task to gain access to and remove the lading without breaking the seals. It is true that certain additional devices, not now used, have been developed which make it more difficult to break into the car, but these cost much more to install and operate than could possibly be saved by their use under present conditions.

"There is one place," continued the railway officer, "which must be carefully watched from a maintenance standpoint, and that is the ice bunkers on refrigerator cars. Hoboes occasionally get into these bunkers, break through the screen and remove lading from the car. This is particularly true where the screens are not sufficiently heavy and are not properly applied and maintained. An additional safeguard may be used in the form of cross rods, so applied that they cannot be removed from the inside of the bunkers."

Cinders

Realizing that we were not getting very far from the standpoint of theft. I shifted my attack to a more general one by inquiring about important factors within the control of the mechanical department that were responsible for damage to property.

"While I believe that the danger is greatly over-rated,"

* Ninth of a series of interviews with men outside the mechanical department, commenting in a constructive way upon the possibilities of that department.

replied the railway officer, "everything possible should be done to reduce the amount of cinders discharged from locomotive stacks. There is a bad psychological reaction when people along the right-of-way are showered with dead cinders, even though they are of small size, and this reaction is even more pronounced when live cinders can be seen issuing from the stacks at night, even though they may be entirely harmless.

"Aside from this, however, the cinders do considerable damage to some types of lading, when they get into box and refrigerator cars. To prevent their entering these cars the doors should be so designed and maintained that they will be close fitting. It is important, also, that they fit snugly at the bottom, so that snow and dirt cannot be sucked up into the car and settle on the lading. We used to have trouble from the cinders gradually working in through the roof, but modern types of all-steel roofs have obviated this difficulty. The damage done by cinders to some classes of lading, however, is so great that no effort should be spared to maintain the cars cinder-proof."

Draft Gear

"Do you have much damage to the lading from abnormal shocks?" I asked.

"Yes, but we have been successful in reducing it considerably," replied the railway officer. "The use of impact registers in the cars has enabled us to check up and locate where these shocks take place. In not a few instances we have found that they were due to improperly maintained draft gear. I cannot too strongly emphasize to the mechanical department officers the importance of periodically checking up on the condition of the draft gear and in seeing that it is maintained in a proper operating condition."

Stock Cars

"Your road handles a large amount of stock. Can the mechanical department do anything to improve the design and maintenance of these cars?"

"Yes," replied the railway officer. "In the first place, there is a possibility of damage if there is too much of an opening near the floor, in which the animals' feet can be caught. For this reason we recommend that the first side board should be placed flush with the floor and that the second one should be placed not much over three inches above the first. Then, too, it is advisable, in our opinion, to have plenty of openings near the roof, so that the heated air may escape. Obviously sharp corners or projections should be entirely eliminated inside of the car. Door posts, for instance, should be made as round and smooth as possible, and door hasps should be properly located. While these details may appear to be unimportant, taken as a whole they mean much in reducing loss and damage to the stock.

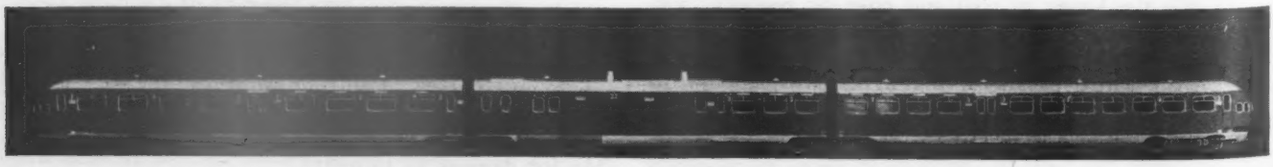
"Summing up," continued the railway officer, "the mechanical department has given us excellent co-operation. The latest equipment has been excellently designed to protect against loss and damage to the lading. The biggest problem is with the older equipment, which does not include the latest and most up-to-date construction and devices, and this is particularly noticeable if it is not maintained to a high standard."

Forty Diesel-Electric Trains For the Netherlands Railways

Holland decides to use three-car, articulated, light-weight, unit passenger trains. Propelled by two 410-hp. Diesel-electric motors and streamlined for high speeds

INFLUENCED probably by the popular success of the famous German streamlined high-speed train, the "Flying Hamburger," which operates between Hamburg and Berlin, the Netherlands Railways decided to employ somewhat similar trains on an extensive scale. Following this decision orders were placed for 40 train units, each consisting of three articulated cars to be carried on four trucks and propelled by two 410-hp. Diesel-electric motors. Construction of these cars is well under way and it is planned to have some of the first units in operation by May 15, 1934. Each train unit will have a seating capacity for 48 second-class and 112 first-class passengers. It is anticipated that these trains will recover a considerable portion of the passenger traffic which has been lost to highway buses in recent years.

Inasmuch as these trains resemble in general appearance and in a number of details the "Flying Hamburger" train, attention is called to a description of the German train which was given in the *Railway Mechanical Engineer*, May, 1933, page 160. This train consists of a two-car articulated unit with seating capacity for 100 passengers—space being also provided for a small refreshment room and a baggage compartment—and an overall length of 137 ft. 5¾ in. It is propelled by two 405-hp. Maybach Diesel-electric motors, one being mounted on each of the end trucks. Two electric motors are mounted on the center truck, a motor for each axle. The light weight of the train is 163,976 lb., to which should be added about 6,600 lb. of fuel oil and the weight of the passengers. The train was designed for a maxi-



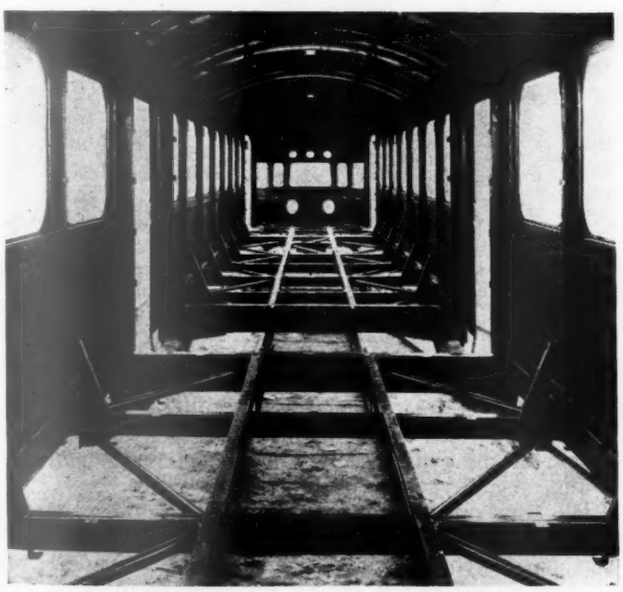
High-speed streamlined Diesel-electric train for Netherlands Railways

mum speed of 99 m.p.h., a regular operating speed of 93 m.p.h., and an average speed of between 75 and 78 m.p.h., on a run of 179 miles.

In comparison with the German train the Dutch trains consist of three-unit sections instead of two-unit sections and are 65 ft. longer, making the total length about 202 ft. 6 in. Despite the increase in length and in carrying capacity there was no increase in weight. This relative reduction in weight was obtained by careful designing; the use of electric welding instead of riveting; the employment of aluminum for many details, such as doors, baggage racks, reservoirs, air ducts and other parts; also the application of pressed-steel wheels and hollow axles. By these means the weight of the new trains was reduced to less than half that of ordinary Dutch passenger cars of equivalent weight and capacity. Lightness of weight, however, was not obtained at a sacrifice of safety. Exceedingly careful study was given to the construction in order to reduce to a minimum any damage that might result from derailment, or from telescoping in event of collision.

The Netherlands Railways have for a number of years made a careful study of electric welding and as a result have brought the process to a high stage of development. Underframes are first erected on jigs and clamped for convenient welding. In building up the body and assembling it on the underframe a squirrel-cage device is employed which is mounted on rollers so that every point of the car becomes easily accessible as the cage is revolved. This device is shown in one of the illustrations. The train being designed for a top speed of 87 m.p.h. has been streamlined as fully as possible comparable with double-end operation.

Of the 40 train units 35 are being equipped with two 410-hp. Maybach Diesel engines and the other five units with two 375-hp. Ganz Diesel motors. The engines are direct coupled to electric generators and are installed in



Interior view of a partially completed unit for Netherlands articulated train

the center of the middle unit. Both motors and generators are supported on rubber cushions of four layers each to reduce noise and vibrations.

Brakes are of the automotive type with separate brake drums and ferrodo lined brake shoes. This system was adopted to obtain smoother and shorter stops and to furnish greater safety at high speeds.

The windows are kept closed at all times, ventilation being secured by the introduction of a supply of fresh air at all seasons. In cold weather the incoming fresh air is heated by the cooling water from the engines. Should the cooling water be of too low a temperature to furnish sufficient heat, provision is made to increase its temperature by passing it through an oil-fired heater. The heating system is automatic, both the temperature in the cars and the cooling water being governed by thermostats.

In order to insure regularity of schedules each train unit has been provided not only with a duplicate power plant, but also with duplicate heating and ventilation

Body and underframe assembled in rotating jig for convenient welding

equipment, one or both of which are instantly available as conditions arise. When using only one of the two power plants a train speed of 63 m.p.h. can still be maintained on a level track, sufficient for most schedules.

The nearest similar train now in operation in this country is the three-car, articulated, streamlined train on the Union Pacific. This train is 204 ft. 5 in. long, weighs 170,000 lb. and is driven by a 600-hp. distillate-burning engine. In length and weight the Dutch and the American trains are almost the same; the Dutch train, however, has a greater power capacity.

Duplate Safety Plate Glass

A LAMINATED plate glass, known as Duplate, is being introduced for railroad service by the manufacturers, the Pittsburgh Plate Glass Company, Pittsburgh, Pa. This glass was used for the windows of the Union Pacific light-weight, high-speed train, and is particularly suitable for service of this character because of its shatter-proof or safety feature as well as its tendency to minimize sunlight glare.

As the name implies, Duplate is produced by laminating or sandwiching together two plates of specially prepared ground and polished plate glass.

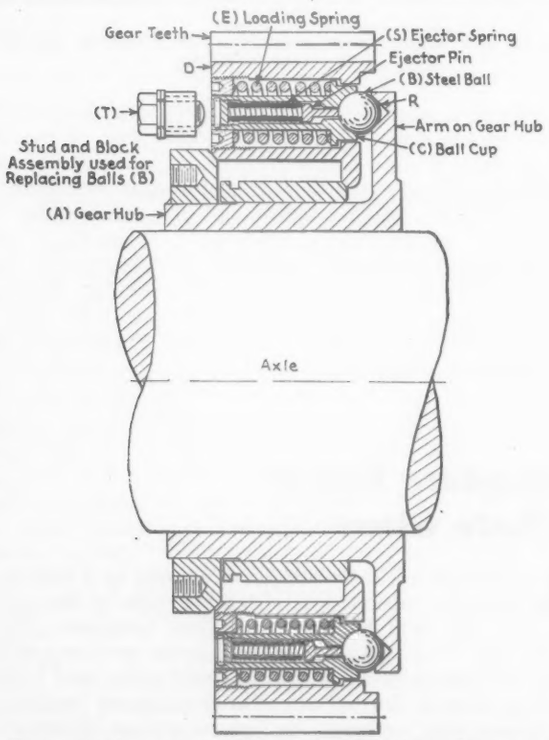
Plastics, from sheets of cellulose nitrate or cellulose acetate, are cemented between companion sheets of glass under a hydrostatic pressure of 190 lb. per sq. in. and a temperature of 250 deg. F. for a definite period of time. The edges are then ground, grooved out to a depth of about $\frac{3}{16}$ in. by removal of the plastic and the groove then filled with a calking compound. Uniformity of product is assured by submitting daily samples to impact test, boil test, baking test and light-transmission test.

Safety Gear for Air-Conditioning Generators

THE use of axle-mounted generators with gear drive for railway passenger car air-conditioning service introduces problems that are not involved with axle-mounted traction motors. The axle-mounted generator is driven by the axle; with the traction motor, the axle is driven by the motor. In the event of mechanical failure of the traction motor, which would prevent rotation of the motor armature, there is no possibility of movement of the car with locked wheels. But in the case of the axle-mounted generator the motive-power for the car is supplied from a source external to the car, and with a "jammed" generator armature, or "jammed" gear and pinion, there is the possibility of car movement with locked wheels, and consequent slid flat wheels. To protect against such contingencies General Electric axle-mounted generators are provided with a "safety" gear, so designed that in the event of the generator armature locking or being excessively overloaded, or if the gears jam, the axle is freed from the gear and continues to rotate without developing flat spots on the wheels.

The sketch shows a cross-sectional view of the safety gear in its normal operating condition.

The gear assembly consists essentially of two main parts—the hub, *A*, which is pressed on the car axle, and

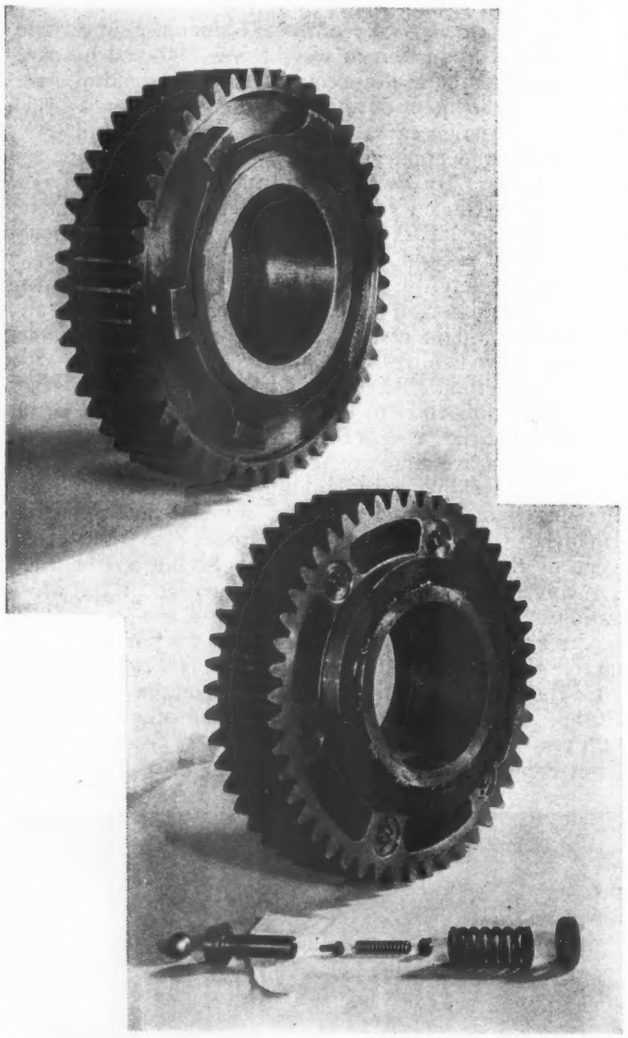


Cross-section of the General Electric safety gear

the gear rim, *D*, which carries the parts that function to release the rim from the hub in the event of emergencies.

There are six ball and spring assemblies located in as many pockets in the rim assembly, and spaced equidistantly around the center. Under normal operating conditions the balls, *B*, are held against and in the sockets, *R*, machined in the arms of the hub. The characteristics of the spring, *E*, and the design of the sockets and balls are such that the unit will not shear because of any coupling shock load which the car structure can stand but will separate if the slipping point of the wheels is approached, such as would occur with a locked armature.

In the event of a mechanical failure in the generator or its gearing, tending to prevent rotation of the car wheels, the shearing effect of the hub arms on the balls forces the balls in against the springs, *E*, permitting



Above, ball side of gear—Below, loading spring side of gear and loading spring assembly

the hub to turn free of the gear rim. The auxiliary spring, *S*, insures removal of the balls from the cups, *C*, once the balls have been forced out of the hub sockets by excessive torque demand. The balls are allowed to drop out between the arms and find their way to the bottom of the gear case, free of interference with the rotating member.

The seats on the hub member on which the gear rim rests in normal service are so designed that when the balls have been dislocated, the gear rim moves to the right as shown in the sketch, and downward, with the gear face resting on the gear case and clear of the rotating hub. The gear is, in view of this action, inherently "trip-free" in its operation and, hence, no renewal of parts after running for long periods with the balls displaced is necessary. Adjustment of the "pull-out" value of the gear may be obtained if desired, by varying the position of the plugs, *P*, in the gear rim sockets.

After an emergency operation, the gear can be restored to normal operating status by removing the gear case and replacing the balls in their sockets.

EDITORIALS

Improvements Necessary in Freight Handling Equipment

The Federal Co-ordinator's report on merchandise traffic, issued the latter part of March, contains several radical suggestions for revising this service on the railways, in the effort to reduce expenses and regain lost traffic. It recommends, among other things, the consolidation of rail l.c.l., express and forwarder traffics, and pooling all rail merchandise services into two competing agencies of comparable traffic and financial strength. It advocates, also, the collection and delivery of merchandise at the patron's door, simplified classification, liberalized packing requirements, less complicated rate structure, and the co-ordination of rail and highway traffic.

Obviously such changes will affect the mechanical department. One paragraph in the report, for instance, comments directly on equipment requirements in these words: "Rail equipment for the handling of merchandise should be modernized. For the present the express and baggage car equipment is sufficiently shock-proof and capable of sufficient speed for merchandise service, although excessive tare weight and deficiency in potential cubical capacity, dimensions considered, tend to make it obsolete. Temporarily, box cars can be made reasonably serviceable for transportation of merchandise by the installation of non-harmonic springs, improved high-speed brakes and wheels. As the present equipment, express and freight, wears out, it should be replaced with light, shock-proof equipment, primarily designed for merchandise service. This equipment should include containers, truck bodies and other units interchangeable between the chassis of rail and highway vehicles."

In another part of the report this statement is made: "The present box car is inferior, either to the motor vehicle or to rail express equipment, in its ability to protect the lading against shocks, oscillation and vibration. Methods and practices used in handling cars in freight trains and yards, such as switching, emergency brake applications and the like, also frequent transfers of lading en route, are further contributing causes of damage to rail l.c.l. freight."

Footnotes relating to the last mentioned quotation indicate that the American Railway Association has just completed road and laboratory tests of several non-harmonic springs for freight cars. The statement is also made that a number of private cars have been equipped with these springs, with successful results, and that the railroads are beginning to use them on box cars. Another note draws attention to the fact that the American Railway Association has now prescribed specifications for draft gears, so designed that they will absorb all end shock up to a speed between four and five miles an hour.

Many difficult problems are involved in the design and construction of the special equipment which in all likelihood will be required, if upon further study it is found advisable to adopt the recommendations made in this report. Certainly if costs of transporting merchandise are to be reduced to a minimum, with the highest possible standards of service, we must be prepared to depart from traditional methods and practices and take advantage of every new development that gives reasonable promise of insuring better results. The recommendations made in the Co-ordinator's report are a distinct challenge to railway executives, including mechanical-department officers and representatives who have the responsibility of providing and maintaining the cars and other facilities which will be required.

Business Increases— And So Does Locomotive Age

So far during 1934 orders have been placed for 20 locomotives by the railroads in the United States. This compares with orders for 42 locomotives during the entire year 1933 and for only 12 locomotives during 1932. But in comparison with the orders for other equipment —both freight and passenger cars—and with the general motive-power conditions, it is far from sufficient.

The total number of locomotives owned has been declining steadily, if not rapidly, for several years. The number of serviceable locomotives has likewise been declining steadily, but at a considerably greater rate. Whereas the number of locomotives reported on line January 1, 1933, was 51,724, and on January 1, 1934, was 49,637—a decline of something more than 2,000 locomotives—the number of serviceable locomotives dropped from 42,166 to 38,742, or nearly 3,500 locomotives within the same period. As there was no great change in the number of locomotives in service during this period, the difference has come out of the locomotives reported as stored serviceable which have declined from 9,387 on January 1, 1933, to 5,913 a year later.

The decline in traffic which took place during the last quarter of 1933 not only has discouraged the purchase of new locomotives, but has also postponed, and in some cases caused the contraction of, maintenance programs which were expanded last summer.

Since the turn of the year, however, there has been a definite upward trend in freight traffic which is greater than seasonal in amount. Freight train-miles in January, 1933, amounted to 30.8 million and in January, 1934, to 34.4 million. While figures are not yet available for the month of March, the relation between car loadings in January and March would indicate a freight-train mileage for the month well up to the peak of 36.5 million miles in last October.

While government activities, and particularly the apparent lack of understanding of the needs of the heavy goods industries, have created grave uncertainties during the past five or six weeks, there is a growing undercurrent of conviction that the forces of recovery are becoming irrepressible. There is reason, therefore, to expect this fall a new peak for the years since the beginning of the depression. An increase in the demand of four or five thousand locomotives could, on the face of the figures, be met from the more than five thousand locomotives now reported stored in serviceable condition. No such draft on this group of power could be made however; fewer than four thousand of these are freight locomotives, and many of the others cannot be used economically. Most of the increased demand would have

to come from the approximately eleven thousand locomotives now unserviceable. How rapidly can the railways reduce the accumulation of unserviceable locomotives while at the same time keeping up currently with the mileage being run out in increasing volume each month?

With over half of the locomotives owned more than 20 years old and not more than 17 per cent of them 10 years or less in age, economy in handling the increasing traffic requires that a beginning be made without delay on the restoration of life in the locomotive inventory by installing new locomotives at the top, as well as by removing the dead wood from the bottom.

Loss and Damage of Freight

Freight loss and damage for the year 1933 as reported by the Freight Claim Division of the American Railway Association for 148 carriers, representing 95 per cent of United States mileage and 60 per cent of Canadian mileage, shows a gratifying improvement as compared to previous years. Incidentally, it is the lowest since 1903. The total for 1933 was $15,485,440, as compared to $18,936,024 for 1932, and $13,726,508 for 1903. Noteworthy among the decreases for 1933, as compared to 1932, are those due to error of employees, 34 per cent; rough handling, 31.9 per cent; delay, 30.6 per cent; concealed damage, 30.3 per cent; improper refrigeration and ventilation, 29.6 per cent; loss of entire package, 27.7 per cent; and improper handling, loading, etc., 26.9 per cent. Unfortunately there were some items which showed increases during 1933. These were, robbery of other than entire package, 70 per cent; fire or marine loss or damage, 38.4 per cent; and freezing or heater failure, 15 per cent.

Why the increase in robbery? Is the mechanical department in any way responsible? What can it do, if anything, to assist in improving this record? In an attempt to answer the last two of these questions a railway officer in charge of the protection of property was interviewed, as reported on another page of this issue. Apparently there is not a great deal that the mechanical department can do, other than to maintain the equipment in the best possible condition. Aside from coal and coke, the largest items included under the head of robbery are tobacco, dry goods, clothing and textiles, boots and shoes, and other manufactured and miscellaneous items.

Progress In Mechanical Research

It is generally recognized that draft-gear research and tests, conducted by the American Railway Association and supplemented by that of individual manufacturers, have resulted in raising the standard of approved draft gears. To an increasing extent, as time goes on, this draft-gear equipment, adapted to modern requirements, will prove an important factor in reducing freight-damage claims of about $15,000,000 a year and car-maintenance expenditures of $120,000,000 a year.

Similarly, the modern type of cast-steel side frame, which means so much in increased reliability of operation and reduced maintenance, has been developed; also the improved Type-E coupler, with increased strength, wear limit and gathering range, and the AB freight brake which promises to effect important improvements in freight-train handling, as well as to reduce operating and maintenance costs.

Sample box cars built to the A. R. A. improved standard design, whereby almost two tons of weight are saved without loss of strength, have been subjected to load and impact tests to develop any potential weaknesses in the design and also as a guide for further improvements. These A. R. A. standard car designs, when placed in general use, will prove an important factor in enabling the railroads to give more satisfactory service at substantially reduced operating and mechanical maintenance costs.

With increased freight-train speeds, the problem of vertical oscillation on truck springs became acute and numerous spring-snubbing devices were developed by manufacturers and offered to the railroads as a solution. In an effort to determine the qualities and operating characteristics required in this type of equipment, the A. R. A. recently conducted laboratory tests of several different designs at the A. R. A. laboratory at Purdue University and supplemented these laboratory tests with extensive and scientifically conducted road service tests at Rochester, N. Y. The preliminary report of the subcommittee on this development has just been completed and will doubtless prove of substantial assistance to the railroads in determining what kind of spring suspension and spring snubbing equipment is required on freight cars subject to modern high-speed operation.

Condensation tests are now being conducted by the A. R. A. in an effort to find a solution to the problem of sweating in box cars with steel roofs when loaded with such commodities as flour or hot cereals. Road service tests with cars equipped with various types of protective materials under the car roof are being conducted in an effort to avoid this sweating and attendant damage claims which are at present reaching substantial figures.

How Near Ready Are You?

The past few years have been trying ones for both men and management. Locomotives have been run as long as they could be kept on the road, then stored awaiting repairs at some undetermined future date. Every effort has been exerted to keep the latest and most efficient power in operation, for, despite reductions in car loadings, freight trains were being moved at steadily increasing speeds. Shop forces have been pared to the bone and deferred maintenance has continued to pile up from month to month to new heights. In some instances back shops have been closed down entirely and the job of maintaining locomotives, even to making classified repairs, has been unloaded onto the enginehouse forces.

After a long period of waiting it can be said that the tide has now definitely turned. Aided by federal loans in many instances, a number of roads are now inaugurating definite plans for rehabilitation of power and equipment. Other roads which so far have recalled but few men are working out plans which will necessitate the reopening of additional shops in the near future. Some of the smaller and less well equipped shops that have been closed down probably never will be reopened again. The work which they formerly did will be transferred to the larger or more centrally located shops, thus throwing an added load of work on such shops. This will tend to make these shops to a certain extent manufacturing points

for the supply of finished or partly finished parts to outlying points and will cause some changes in the character of the work performed.

Assume that you are responsible, for example, for the operation of a railroad machine shop and realize, as you must have that the time is soon coming when the shop will be required to turn out considerably more work than has been called for in some time. The vital question at the moment is, therefore, are you, or will you be, ready to meet the situation when the time comes. Men can be obtained, and while the building up of a shattered personnel will undoubtedly be a trying one in many cases, the difficulties can be surmounted. What about the physical condition of the shop as regards layout and machine-tool equipment? Possibly you feel that you know the shop thoroughly, its capabilities and also its shortcomings. However, would it not be a wise move at this time to stop and take a complete inventory of conditions as they are? Why not study the floor plan and arrangement of machine tools. Are they suitably placed for convenient and economical reception of materials from the storehouse and for the handling of parts from and to the erecting shop? Are aisles adequate and marked out by white lines so that they may be kept clear and free of stored materials? Is there a sufficient number of power trucks and other means for moving materials and are they of the kind best suited to your needs? Are cranes, both overhead traveling and supplementary, together with all types of hoisting equipment, sufficient? Is the air supply adequate and are there a sufficient number of suitably located outlets? Are there enough electrical outlets for attachment of portable tools and lights and are they properly located? Are provisions for driving machine tools satisfactory? How about special machines, attachments for machines, tools, jigs, etc.? While at it, do not overlook the toolroom. Its needs should also be investigated. Questions of lighting, heating, ventilation and toilet facilities are also important as they have material bearing on shop morale.

By making such a rigid inspection, taking ample notes and placing them in writing as though for a report it is more than probable that things which have been overlooked, perhaps for years, will be found and you will then be far better prepared to cope with the inevitable demands which the future will have in store. The most important deficiencies can receive attention first and as new equipment can be purchased suitable stress can be given to the procurement of the machines which will be most effective in increasing output and the reduction of shop costs.

A Problem—What of the Solution?

The steam locomotive is the most important operating factor with which a railroad has to contend, for upon the ability of its motive power to produce transportation economically depends the railroad's chances to operate at a profit. There may be those who will dispute such a statement but the cold fact remains that three of the largest items of railway operating expense—locomotive repairs, locomotive fuel and enginemen's wages—relate directly to steam locomotives and together represent one-quarter of all the money spent for railway operation.

It has been pointed out repeatedly during the past three years that if the railroads are to operate at a profit in the future they will undoubtedly have to do so by effecting economies for they can no longer depend upon increases in traffic due to national and industrial expansion—that period ended about 1918.

Fortunately the opportunities for effecting economies lie within the province of the mechanical department and whether or not these opportunities are grasped will depend in a large measure upon the attitude which mechanical officers adopt toward motive-power problems.

As business improves, and it can not now be denied that it is improving, mechanical men are faced with the necessity of deciding immediately whether they are going to invest money to secure future economies or keep on spending it with no return. Every locomotive over 15 years of age presents an individual problem concerning which a decision must be made as to whether it will be returned to service or retained in service with the definite knowledge that for every mile it runs it will cost the railroad money that might otherwise be saved if it were replaced with a modern unit.

Elaborate studies have been made which indicate the potential economies of modern power and the operating experience of roads with modern power substantiates the indications of these studies. There is now no question as to the ability of modern power to contribute to savings in fuel and increases in the capacity for hauling heavier trains at higher speeds.

The locomotives that have been placed in service within the past 10 years have demonstrated conclusively that they can be maintained for considerably less than older power. Analyses of the repair costs of more than 10,000 locomotives, made by the Baldwin Locomotive Works, indicate that a 20-year-old locomotive costs nearly twice as much to repair, per potential work unit as a locomotive three years old and more than four times as much as a locomotive just installed in service.

What is true of locomotives is just as true concerning locomotive repair facilities. During the past five years, while the railroads, because of declining revenues, have given little attention to the problem of adequate repair facilities, the machine tool and shop equipment industries have been making steady progress in the development of modern equipment and methods. In looking into the future the mechanical man can no longer ask himself whether he can afford to use the money which increased railway revenues are bringing by investing in modern shop equipment, but must decide immediately whether he is wasting his company's money by retaining in service obsolete machine tools and shop equipment.

The basis on which the railroads developed during the period of the expansion of facilities has resulted in the building up of locomotive repair plants representing an excess of capacity in obsolete equipment the existence of which has encouraged the growth of many uneconomical practices. The problem of future economies in locomotive repair work is one which can best be approached by a consideration of the desirability of consolidating facilities and concentrating repair operations at centralized plants where the volume of work will be sufficient to enable the roads to take advantage of the potential economies of modern repair equipment.

While locomotive repairs involved an expenditure of only 193 million dollars in 1932—as compared with 409 million in 1929—a part of the difference was at the expense of an accumulation of deferred maintenance now amounting to more than 200 million dollars. What assurance have we that by 1938 the locomotive repair bill will not represent a greater proportion of total operating expenses than it did in either of these former years? Certainly this will happen unless measures are taken to effect improvements in keeping with those already made in other phases of railroad operation. The problem is clearly defined—what is your plan for its solution?

THE READER'S PAGE

Threads for Staybolt Taps

To the Editor:

In regard to staybolt taps, I should like to ask a question about tapping out overhead holes. The railroad company for whom I have worked for years always buys five-fluted spiral taps, V thread. Before a new tap can be used we are obliged to take it to the toolroom and have it backed off; we never can use a new tap without doing this. What is the reason for this? I have tried to find out but nobody here seems to know. The shop is not fixed so that we can turn the boiler over and tap holes as is done in the larger shops. We go up and tap down. If we use a new tap without backing it off first, it will ream out and flatten threads. After being backed off, however, we get a good thread. I wish the company would use U. S. threads or Whitworth threads and we would have more success fitting bolts—V threads are too sharp. I hope you can enlighten me on this matter.

Ralph G. Shultz.

Why Cross-balance? An Answer

To the Editor:

In your March issue a correspondent under the initials G. E. discusses locomotive counterbalancing. He concludes by saying: "Surely this subject should be better understood." I thoroughly agree and offer, for example, G. E.'s statement: "Why cross-balance anyway? If there results any reduction in dynamic augment, the decrease is accomplished by reducing the percentage of reciprocating weight balanced." This shows a complete misunderstanding of the subject. It is possible, by cross-balancing, to reduce the dynamic augment and at the same time to suppress a couple which acts in the same direction as the inertia force of the reciprocating parts. In effect the dynamic augment is reduced and more balance provided for the reciprocating parts.

This can be seen from Fig. 1, part 43, of your February issue. Consider a pair of main wheels with rotating parts, as shown in Figs. 1a and 1b. The rotating parts have an equivalent weight of 2,490 lb. in each wheel. The inertia effect of these parts is equivalent, as shown in Fig. 1b, to two equivalent weights in each wheel, one of 2,870 lb. at the crank pin, the other of 380 lb. acting 90 deg. back of the pin. The wheels would be statically balanced by adding an equivalent weight of 2,490 lb. in each wheel directly opposite the crank pin. This would leave a dynamic unbalance in each wheel corresponding to an equivalent weight of 380 lb. acting along the crank and an equal weight acting 90 deg. back of the crank. The resultant of these producing dynamic augment is 537 lb., which, at diameter speed, will develop a force of about 25,000 lb. The equivalent weight acting along the crank, together with the equal and opposite equivalent weight in the other wheel acting in the same plane, produce a couple which supplements that due to the inertia effect of the reciprocating parts.

Now if the rotating parts are cross-balanced, or, in other words, dynamically balanced, the dynamic augment will be eliminated. The balance provided for the reciprocating part will not be reduced as stated by your correspondent. On the contrary, the effect will be to reduce the torque which would otherwise work with the inertia effect of these parts.

Many of the other statements made by your correspondent are equally poorly founded on fact. One of them, however, I accept. This subject should be better understood.

Lawford H. Fry,
Railway Engineer, Edgewater Steel Company,
Pittsburgh, Pa.

In Defense of "Dave" and "Alec"

To the Editor:

The person who signed himself "A Car Inspector" in a letter published in the February issue of the *Railway Mechanical Engineer* sounds like the same person who, when he found himself in jail on some imaginary offense yelled, "you can't lock me up." Well, anyway he was in, and likewise there *are* such characters as "Dave and Alec."

Should only educational and inspiring articles be printed in the *Railway Mechanical Engineer,* and in other periodicals as well, writing and printing would soon be among the lost arts. Certainly even a car inspector would bemoan such a condition. In fact, what would become of all the humorists and would-be humorists that infest the country? Our comic artists would likewise be extinct. When an article of the "Dave and Alec" type appears, it brings to the mind of the experienced car inspector some of the foolish things he did in his early years, or some similar action on the part of fellow workers. Certainly it is no reflection on car inspectors as a group to relate such experiences; one does not have to stretch his imagination to the breaking point, if he has really been around where cars are interchanged, to recall in the not too distant past that things just as foolish have happened at some of our largest interchange points.

"Dave and Alec" would look like amateurs in comparison with some of our big shots when it comes to misinterpreting the A.R.A. rules. If there were no such characters, A.R.A. Supplements to the Rules, Arbitration Decisions or the present interpretations after the rules as now printed would be as unnecessary as radio crooners.

"Dave and Alec" may not know the rules and probably not the address of an up-to-the-minute car inspector, but they certainly are true to life, and human. Otherwise why all the A.R.A. Committees on Rules?

I doubt very much if "Dave," or even "Alec," ever heard of a Wheel and Axle Manual, but one of them must have been on speaking terms with intestinal fortitude and wouldn't take a chance.

Just Another Inspector.

With the Car Foremen and Inspectors

Improved Method of Making Wheel Changes

ONE of the most important operations in freight car repairs is the proper application and removal of freight car wheels in such a way as to avoid bruising the highly polished car journals and at the same time keep the labor cost and delay at a minimum. During recent months the Chicago, Milwaukee, St. Paul & Pacific has made a particular study of this subject and installed improved equipment and methods at a number of car repair points such as Bensenville and Galewood, Ill., West Clinton, Ind., South Minneapolis, Minn., etc. Special equipment, now being built for other points also, includes an air jack to save labor in jacking cars; a special truck-assembling device which saves labor as well as avoids possible damage to the journals; a wheel carrier for conveniently moving the wheels (without the use of a wheel stick, or rolling in soft ground) from the standard gage track to the cleared roadway beside the car; and an electric lift truck which is a great labor-saver in handling wheels to and from the wheel shop, wheel storage tracks, or supply car.

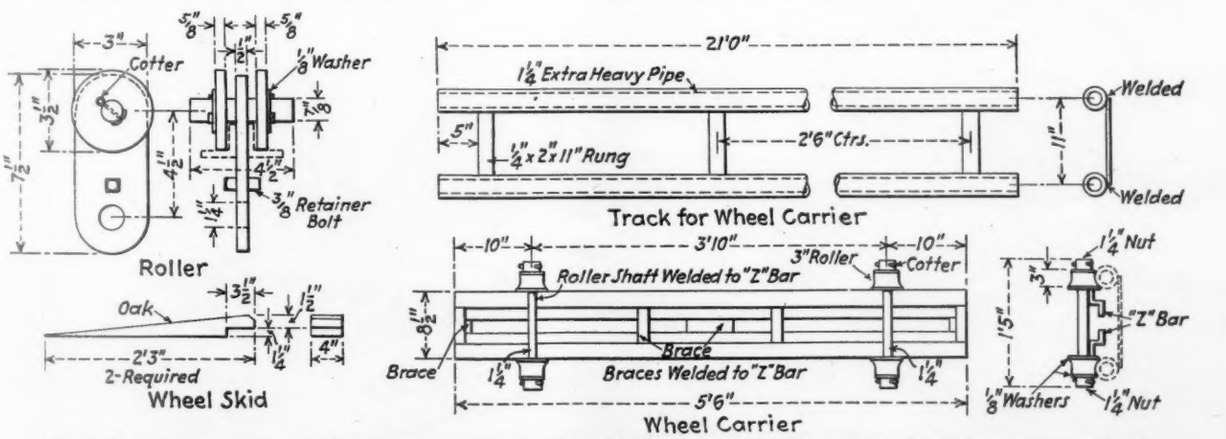
Referring to the illustrations, the construction and use of all of these devices are quite clearly shown. The air jack consists simply of a large 14 or 16 in. air cylinder reinforced with tie rods between the cylinder heads and supplied with air through the usual rubber hose connection from the shop air line. This jack is placed under the coupler pocket casting on one end of the car, upward movement of the piston and rod easily raising the car without the manual labor involved in hand jacking. As a safety measure, suitable wooden horses and blocking are used to follow up under the car sides as the car is raised, similar precautions being taken in lowering the car again, after application of the repaired truck.

Air jack used in raising cars for the removal of trucks needing repairs

With the car resting on the horses the bad-order truck is rolled from under car and is ready for dismantling by means of the device shown in another illustration. This device consists of a riveted metal framework supported on four legs and carrying three chain hoists suspended from rollers and capable of movement along the horizontal bar. The device is 10 ft. 3 in wide and 6 ft. 9 in. high overall, the height under the horizontal bar being 5 ft. 2 in. The legs, spaced 2 ft. 6 in. apart at the bottom, are made of 1½-in. angle iron, joined at the top by rivets to a ½-in. triangular plate. A strap made of ¼-in. by 1½-in. iron, is bent to the shape shown and riveted at the top and bottom to the lower part of each leg to give increased bearing surface on the ground and thus avoid the necessity of special blocking.

The horizontal bar, mentioned, consists of two 1½-in. angles, spaced slightly over ½-in. apart and supported by four steel tie bars from an overhead arch made of ½-in. by 2½-in. steel, bent at the center and also at each end where it is firmly riveted to the horizontal angle irons and to the top of the triangular end plate, which is bent over 3½-in. to provide the necessary support.

The spacing of the horizontal angle irons provides for passage of the ½-in. by 3-in. by 7½-in. vertical steel strap which is suspended from each pair of 3½-in.



Details of the wheel carrier and track arrangement which greatly facilitates the handling of car wheels

rollers and which forms the hoist support. The double rollers, of course, move on and are held in place by the angle irons. The vertical straps and roller assemblies are kept in place on the angle irons when the device is being moved about the repair tracks by means of a ⅜-in. retainer bolt in each strap.

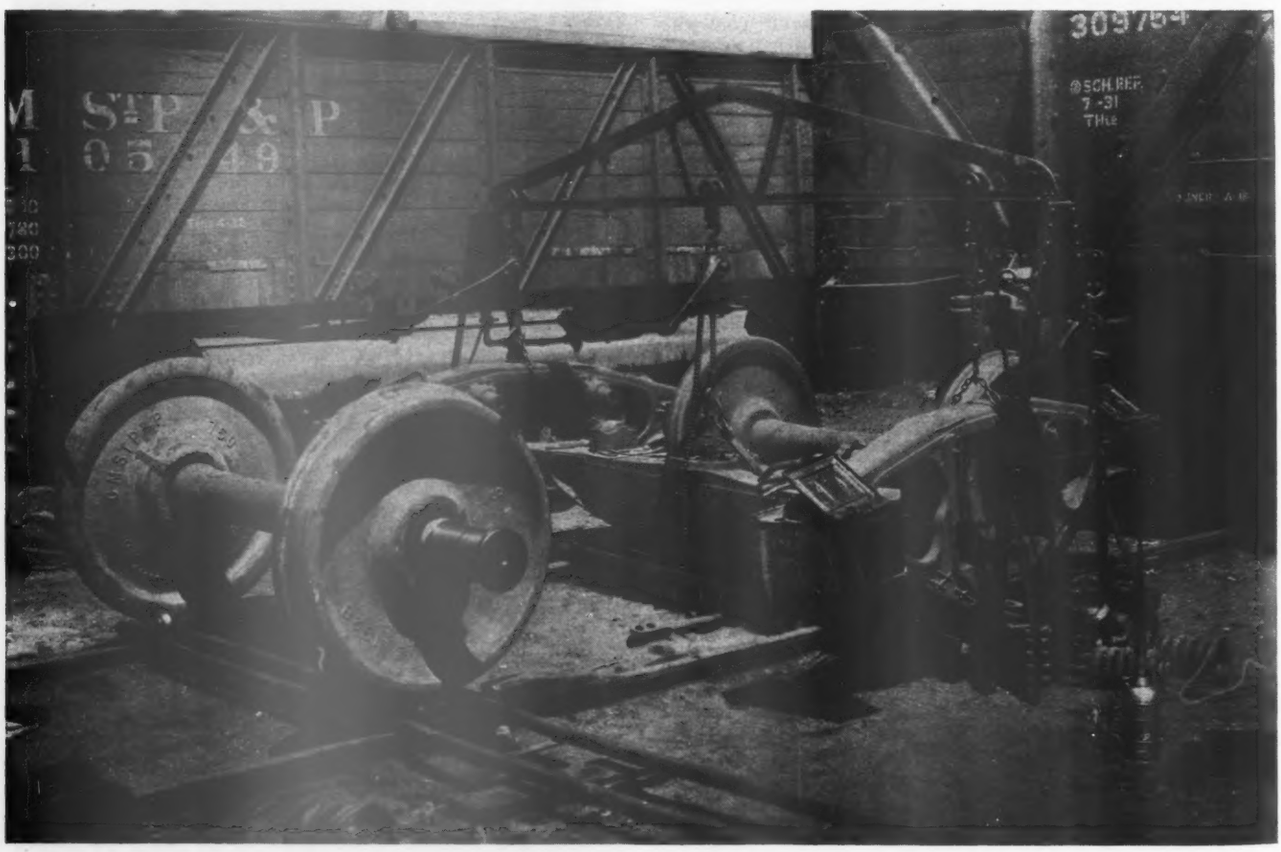
It will be noticed that the space in which the center roller can move crossways of the device is somewhat restricted, but ample for the requirements. The two outside rollers also do not have full travel along the angle irons, but can move a distance which is entirely adequate for the purpose intended. While other types of hoist can be used with this device, the particular ones illustrated are of a ¾-ton capacity and of a convenient lightweight roller-chain and sprocket design, made by the Coffing Hoist Company, Danville, Ill.

In operation, the center hoist is connected to the bolster and the two outside hoists to the side frames which can be readily lifted and pushed off over the journals, since the weight is supported on rollers. The reverse operation is used in re-assembling the trucks.

This device can be easily carried from car to car no matter where located and it is not necessary to have concrete or plank roadways. It can be used for removing and replacing any truck parts as well as brake beams which can be done at the time of the wheel changes if necessary; it is easily controlled and operated by two men affording sufficient power to raise the truck sides or frames and bolster; it eliminates possible damage to car journals and dust guards when removing or replacing the truck sides. It also supports the truck bolster at the proper elevation so that the truck springs and blocks can be readily removed.

The hoists hold all parts in convenient working position so the operator can remove and replace the dust guards and clean out the journal boxes of old grit and packing. It further prevents the possibility of grit or particles of packing falling on the journals prior to the application of the journal bearings, thus greatly assisting in the reduction of hot boxes and train delays. One of the important factors in the operation of this device is accident prevention, due to the practical elimination of heavy lifting as well as possible injury to hands or fingers in removing and replacing journal bearings and wedges.

Electric lift truck which saves labor by handling three pairs of wheels at one time



Convenient truck assembling and dismantling device used at a number of car-repair points on the C. M. St. P. & P.

Another novel feature of this method of handling

truck repairs consists in the special wheel carrier used to move the wheels from the standard gage track laterally to a roadway where it can be subsequently moved by truck to the wheel shop. This wheel carrier consists of a built-up structure made of Z-bars, 5 ft. long, welded into a rigid framework by means of suitable cross braces and arranged to move on four rollers, which are supported and roll on two pieces of 1¼-in. extra heavy pipe, spaced 11 in. on centers, and held accurately to this gage by means of welded cross braces spaced every 2 ft. 6 in. Oak wheel skids are used to assist in rolling the wheels onto the wheel carrier, which is then readily pushed across the track as required. The lift truck then takes the wheels, two or three at a time, if available, for movement to the wheel shop.

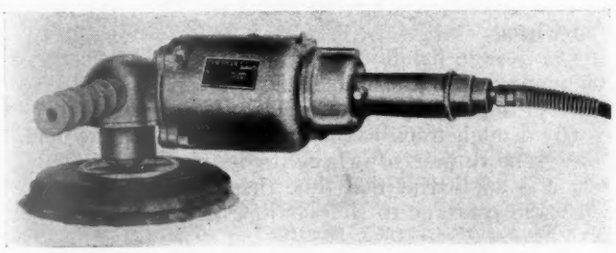
Comparative figures for the complete cost of changing one pair of wheels by the former methods and by those described are shown in the accompanying table. It will be noted that the use of this device resulted in a saving of 67 per cent of the previous cost.

Comparative Cost of Changing One Pair of Freight Car Truck Wheels

Operation	Old Method	New Method	Saving
1—Jack up car, remove truck including obtaining jacks, blocks and horses	$0.31	$0.11	$0.20
2—R. R. & R. packing, cleaning journals	.10	.10	
3—Dismantle truck, R. R. & R. dust guards	.39	.15	.24
4—R. R. & R. wheels	.14	.03	.11
5—Reassemble truck	.66	.27	.39
6—Shove truck under car, jack down, remove horses, blocks, etc	.27	.11	.16
7—Take scrap wheel from car after removal to scrap wheel storage and return with new wheel to car	.70	.07	.63
Total time consumed	4 hr. 26 min.	1 hr. 30 min.	
Average number of men used	4	2	2
Total cost	$2.57	$0.84	$1.73

Electric Polishing and Sanding Tools

THE Buckeye Portable Tool Company, Dayton, Ohio, has developed a new high-frequency electric portable tool for rubbing down and polishing lacquer. The No. 57-1800 polishing and rubbing tool has a speed of 1,800 r.p.m. and is ordinarily furnished with a two-



Hercules No. 57 polishing and rubbing tool

phase, 180-cycle, 225-volt motor, although a 110-volt motor can be supplied if so desired. Either 8-in. or 9-in. discs with rubbing pad or lamb's wool may be used. The overall length is 16¼ in. and the weight 10½ lb. An effective ventilating system adds to the ease of operation and is arranged to blow the dirt away from the operator. Another special feature is the renewable insulating pad which supports the rotor, it being so designed that it can be replaced without loss of the housing.

The No. 56-4700 sander is identical in construction with the No. 57 tool except that it is speeded to 4,700 r.p.m. and is equipped with abrasive discs or cup emery wheels for sanding or grinding.

The Supervisor in Accident Prevention

*By F. J. Swanson**

THE railroads have accomplished a wonderful feat by reducing their injury claim payments to employees and the public about $30,000,000 in the past 10 years. Accident-prevention is not an embroidery fringe on production; it is an integral and, therefore, an important part of production. Safety of employees and others must be considered first in order to have a successful and efficient operation. Safety records, already achieved, can be still further improved.

First of all, the department head must feel and assume his responsibilities and become entirely sold on the idea. The matter of providing a safe place for men to work is put squarely up to the supervision. The result will depend entirely upon our intelligence, watchfulness, careful planning and the application of corrective measures. It is important that each supervisor personally know that every employee under his supervision possesses normal hearing and sight in order to be a safe employee. It is also the responsibility of the supervisor to see that tools and other facilities are in the best possible condition.

A supervisor should be gaged by the way he plans his work in a safe manner, thus avoiding injuries. One who has no accidents almost always can be counted upon to have a good operation in other respects. We pick a supervisor because he possesses some exceptional all-around ability or qualifications that make him an outstanding figure among the group he is to lead. He is expected to be thorough, efficient and decisive, ready to give intelligent, constructive advice at all times to those in his charge. Failure in part to perform what is expected of him results not only in loss of efficiency, but in a breakdown in the morale of the men. In plain words, we cannot expect men to follow a leader who talks safety at safety meetings and then feels, because in charge, he is entitled to special privileges.

Men look to their leader to be outstanding. He must be thoroughly familiar with every safety rule applicable to his departmental work. He must see that they are all put in effect. He must continually watch all working conditions, both for unsafe and safe practices and equipment, making immediate correction where found unsafe, and using the benefit of a safe practice as an educational feature to promote further safety throughout the department.

A method of further training and education of foremen should be so perfected as to insure the company that each crew is protected by at least one 100-per cent safety man. Through his complete knowledge and understanding of safety practices, he is able, as a leader, to bring about the desired results.

Any accident, trivial as it may be, should be taken with the seriousness of a major accident. Perhaps an inch or less was the only separation between the slight mishap and what might have been a reportable injury. A man experiencing only a slight mishap should not be allowed to continue work with only a casual shake of the foreman's head to denote his disapproval but, on the contrary, should first be talked to until he fully understands the safe method of doing his work. A good constructive safety talk to a man like this will do much to help him, as well as others in his crew, who will find him trying to execute his work in a safe manner.

The very essence of accident-prevention work on the

* General car department supervisor, Chicago, Milwaukee, St. Paul & Pacific, Minneapolis, Minn.

part of the supervisor lies in the analysis of accident data and the development of preventive methods. Some of the undesirable conditions which may be found are as follows: Improper instruction to employees, lack of team work, poor discipline, playing on the job, chance taking, undue haste, unsafe practices, inadequate tools and facilities, improper working conditions, improperly piled or stored materials, congestion, poor illumination and poor housekeeping, improper handling or layout of operations, use of methods unsuitable for the work and improper dress or apparel, such as loose clothing, sleeves and poor shoes.

In order to secure the most desired and efficient results, the highest type of co-operation is required at all times between the executive heads, supervisors, employees and all individuals, as well as advisory groups. Further success can be achieved by all being "safe minded."

Air Brakes in Passenger-Train Service*

By H. T. Wentworth†

PASSENGER trains were satisfactorily controlled with low pressures until 1894, in which year the high-speed brake was introduced to provide greater safety for increased car weight and faster train schedules. The brake-pipe pressure was increased from 70 lb. to 110 lb., making possible three applications of substantially the same value without recharging. The high-speed reducing valve was added for the purpose of limiting service applications to a brake-cylinder pressure of about 60 lb. and automatically to blow-down maximum brake-cylinder pressure to about 60 lb. following an emergency application.

This equipment was superseded by the LN equipment in 1908, the improved features of which were graduated release, quick recharge and high brake-cylinder pressure during emergency applications. The introduction of heavy steel passenger cars, however, made it necessary to apply two separate brake equipments or resort to a brake cylinder exceeding 18 in. in diameter. As the use of a larger cylinder was objectionable, double equipment became imperative.

During tests in 1909 the PC equipment was introduced, making possible the control of cars of maximum weight with a single brake cylinder, whereas it had been necessary to provide double LN equipment. The PC equipment was designed to operate with 110 lb. brake-pipe pressure and develop 86 lb. service brake-cylinder pressure, but as the initial brake-pipe pressure was decreased, the brake-cylinder pressure and braking force was decreased correspondingly.

In 1913 the UC equipment was introduced and it incorporated all the advantages of the PC equipment, with the exception of the maintaining feature which was found necessary. Increases in passenger-train weights and speeds were followed by modifications in the U-12 valve and 6-ET locomotive brake equipment and the application of release chokes to the PM, LN and PC equipment, making the operation of brakes throughout the train so harmonized as to greatly reduce slack action, and thereby improve the smooth handling of the train.

When these changes were made the U-12 valve was known as the U-12-B. Recently a strainer cap was provided for the equalizing portion to eliminate failures which were caused by dirt and scale in that portion, and also to improve the action of the valve between cleaning dates and by its installation the U-12-B valve then became known as the U-12-BC. This strainer cap proved so satisfactory that a strainer portion has now been developed and is recommended for the emergency portion. With its application the symbol of the valve has been changed to U-12-BD.

Other Causes of Rough Handling

With all the improvements in air-brake equipment and the method of handling there are some things which cause failures and complaints of rough handling which cannot be directly charged to, or eliminated by air-brake devices, a few of which are:

(1) Accumulation in winter of snow and ice on body brake levers due to draughts and suction created by the motion of the train lifting the snow which mingles with steam and water emitted from steam-heat equipment, thaw-out devices, waste connections, etc., together with such steam leaks as may exist at couplings between cars, all of which blow up and around everything underneath cars, settling upon every inch of space and building up at times to immense proportions where it freezes and must be chipped off and thawed out on arrival at terminals. Such conditions often result in destroying a considerable proportion of the braking forces and at other times may cause brake shoes to drag to such an extent that unduly high wheel temperatures are often found under these conditions.

(2) Formation of ice on the drain cocks of reservoirs which has been known to weigh as much as 150 lb. often leads to failures when an inspector attempts to remove the ice with a hammer or when it is hit by other pieces of ice that may from time to time become loosened from underneath the car when the train is in motion.

(3) Handling of cars in switching yards without being particular to see that all brakes are properly released or no brake shoes frozen to the wheels is often the starting point of slid flat spots.

(4) An emergency brake application necessitated to avoid striking automobiles at grade crossings, or other causes, especially at low speed, is another cause for slid flat wheels.

(5) Rough handling of trains often charged to poor manipulation of the brake may be caused by excessive slack in improperly maintained draft gear.

(6) Rough track has a tendency to cause the load on one or more pair of wheels to be changed, and if the brake is applied at that time these wheels are liable to start and continue to slide as long as the brake remains on.

(7) Under winter weather conditions with extreme cold and snow it is difficult to make schedule time and the engineman is inclined to make up this time by entering the stations at which stops are to be made at a speed which necessitates a heavy brake-cylinder pressure being used up to the moment of stopping. This tends to cause the stop to be rough and wheels to slide.

(8) Numerous failures are caused by lack of attention in blowing all scale and iron chips out of the piping before it is connected up, when cars are in the shop for general overhauling, on repair tracks, or when purchased new.

The brake equipment for passenger train cars is so designed that the maximum calculated pull between brake shoe and wheel is never equal to the calculated pull between the wheel and the rail, so when rail con-

* Abstracted from a paper presented at the March, 1934, meeting of the Eastern Car Foremen's Association.

† Service engineer, The New York Air Brake Company.

ditions are normal and the car weight is uniformly distributed on all wheels in the truck they will not slide with a predetermined maximum brake-cylinder pressure. It is only possible for wheels to slide when rail conditions are below normal or when a part of the weight is temporarily removed from one or more pairs of wheels due to sudden changes in slack, rough track or passing over frogs, etc. Therefore, when rail conditions are below normal see to it that the engineman is allowed sufficient time in making stops so that it can be done with a low brake-cylinder pressure after speed is reduced or at point of stopping. Then if rough handling or slid flat wheels occur it is always well to check loose slack in draft gear. When irregularities occur, attention is usually centered on air brakes, but in many instances it is doubtful if sufficient importance is attached to contributing causes.

Due to the recent depression it has been a struggle for air-brake supervisors to maintain a sufficient supervisory force. An air-brake foreman is no less important from the point of view of economy than any other foreman; his information conveyed to others will frequently avoid the removal of a device which may be in no way responsible for some defect incorrectly reported. There never was a time when the work of cleaning and testing brakes was so important as at present.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Loose Wheel and Cut Journal—New Wheel Betterment Charge Sustained

The Seaboard Air Line shopped a Southern Railway car on account of cut journal. In making repairs new wheels and a second-hand axle were applied and bill rendered the Southern for the difference in value of two new wheels applied and two second-hand wheels removed, showing on their billing repair card one second-hand wheel, one loose wheel. Exception was taken by the Southern to betterment charge on the ground that the wheel reported as loose was not a condemned wheel in the sense that it was to be scrapped and further that the removal was on account of a cut journal—a delivering line defect—and this has preference over an owner's defect. Failing to agree, an appeal was made for a decision as to whether or not a loose wheel as covered by Rule 81, which can be remounted for service, is to be considered as condemned on account of owner's defect, or whether handling line should assume all liabilities on account of repairs made primarily on account of delivering line defect. It was the contention of the Southern that wheels were removed primarily on account of cut journal, at which time the car repairer reported one wheel loose on indication by oil seepage; that second-hand credit was allowed for the reason that both wheels were serviceable and were afterwards reapplied; and furthermore that a cut journal was a handling line defect and consequently the handling line should assume the entire expense in connection therewith. The Seaboard, on the other hand, while acknowledging the cut journal as a handling-line defect, contended that a loose wheel as listed under Rule 81, 1931 Code, is a bona fide owner's defect and whether or not the loose wheel is untfi for further service on that axle does not enter into the question of whether the wheel can be classed as condemned on account of being loose on that particular axle.

In a decision rendered April 7, 1933, the Arbitration Committee said that: "Rule 81 clearly establishes loose wheel as owner's responsibility. Rule 98, section (b), paragraph (2), establishes proper charge and credit for owner's defects in connection with cut journal. The charge of the Seaboard Air Line is sustained."—*Case No. 1725, Southern Railway vs. Seaboard Air Line.*

Responsibility for Alleged Wrong Size Arch Bar

The Southern Railway rendered a bill to the Seaboard Air Line for applying a bottom arch bar 1½ in. by 4½ in. to replace one found broken on an 80,000-lb. capacity gondola. Billing repair card was returned with joint evidence card showing arch bar standard to car "1¾ in. by 4½ in. or 5 in." After exchange of correspondence without effect the Seaboard billed the Southern under Rule 13 for replacement due to wrong repairs to offset original charges made. In appealing for decision the Southern claimed that the bar applied was the same size as the one removed, that the joint evidence card was issued under a mistaken impression that Rule 26 made mandatory the use of A. R. A. arch bar sizes in event of renewal, and that the Seaboard had arbitrarily changed the standards for their cars to those of the A. R. A. standard arch bars, but were applying A. R. A. standard bars to their cars only in cases where renewals were required or in case of alleged improper repairs. The Seaboard, on the other hand, contended that the application of a bar 1½ in. by 4½ in. constituted an improper repair in that it conformed neither to the original equipment size, 1⅜ in. by 4½ in., nor with their present standard size of 1¾ in. by 4½ in.

In a decision rendered April 7, 1933, the Arbitration Committee said that: "The joint evidence card is deficient for the purpose of establishing responsibility of the Southern Railway in that it fails to show location of bar for which wrong repairs is claimed, or whether it was a top or bottom bar. It also shows that the size standard to the car was 1¾ in. by 4½ in. or 5 in., which latter statement is in conflict with the brief submitted by car owner. The contention of the Seaboard Air Line is not sustained."—*Case No. 1724, Southern vs. Seaboard Air Line.*

ACTIVE DEMAND FOR BOX CARS.—Business may have been a little dull, until recently, for manufacturers of freight cars, but the demand for one type of box car has been consistently active, depression or no depression. Ever since the War, the yearning on the part of returned American soldiers for replicas of French box cars of the "40 and 8" variety has been unabated. In fact, it is said that approximately 100 reproductions of the tiny French box cars are constructed each year in the United States from blueprints furnished by the French State Railways. What purpose these cars serve during the greater part of the year is an open question, but during the annual conventions of the American Legion they are much in evidence.

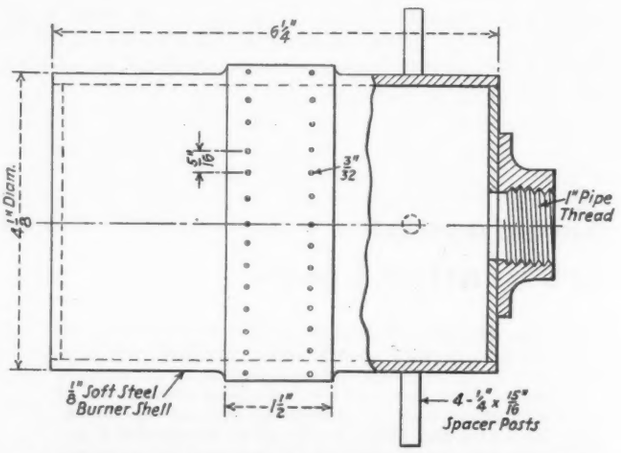
In the Back Shop and Enginehouse

Bending Large Pipe

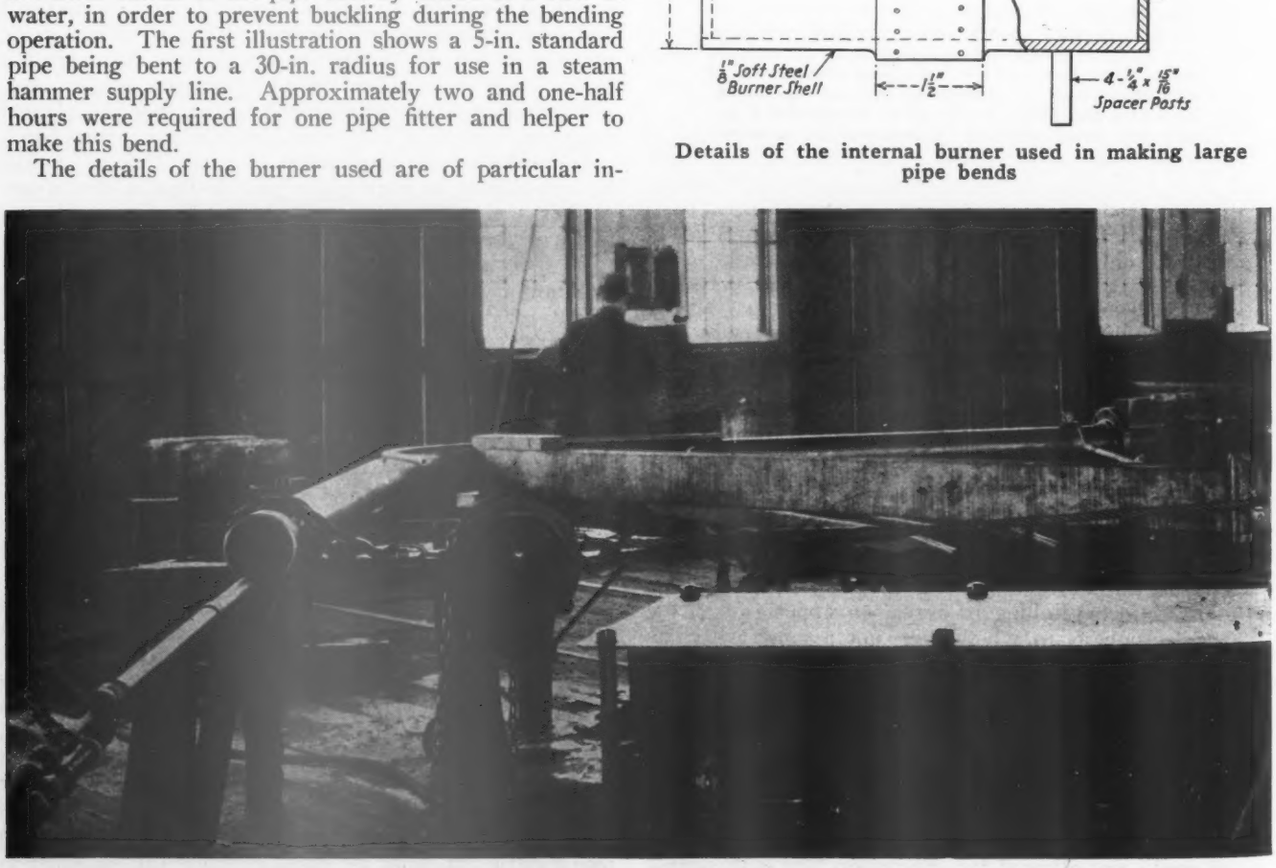
AN effective method now being used at the Milwaukee shops of the Chicago, Milwaukee, St. Paul & Pacific for bending large pipe involves the use of an internal burner or heating device which appears to work quite satisfactorily. The pipe bent comprises pipe over 4 in. in diameter and used for feedwater heater lines, expansion bends in power-plant piping and other similar applications. For this large pipe, the bow method of bending is used which consists essentially of connecting a steel cable and chain falls to the two ends of the pipe with a beam or "arrow" bearing against the steel cable on one end and against the middle of the pipe at the other end. The entire arrangement is supported on horses at the proper level for convenient work.

In general, the method of operation consists of applying the internal heater to the point where it is desired to begin the bend and, as soon as the pipe becomes hot at that point, tighten the wire cable by means of the chain falls until the pipe is bent slightly. The internal heating unit is then withdrawn slightly and the pipe again bent, this process being continued until the complete arc desired has been made in the pipe. It is important to keep the inner radius of the pipe cool by means of a flow of water, in order to prevent buckling during the bending operation. The first illustration shows a 5-in. standard pipe being bent to a 30-in. radius for use in a steam hammer supply line. Approximately two and one-half hours were required for one pipe fitter and helper to make this bend.

The details of the burner used are of particular interest. The burner body consists of a piece of standard pipe 1½ in. smaller in diameter than the inside of the pipe to be bent. In other words, for the best results, it is necessary to have a number of burners, one for each size of pipe. The standard pipe section which comprises the burner body is 6 in. long and blanked at each end by welding in a disc. Leaving a length of 1½ in. at the center of the original diameter, the ends are reduced ¼ in. in diameter to provide space for the necessary flow of air. Holes are drilled in the burner, as illustrated, being 3/16 in. in diameter and located 5/16 in. apart. Spacers, four in number, are welded in place to hold the burner central in the pipe. A pipe fitting is welded



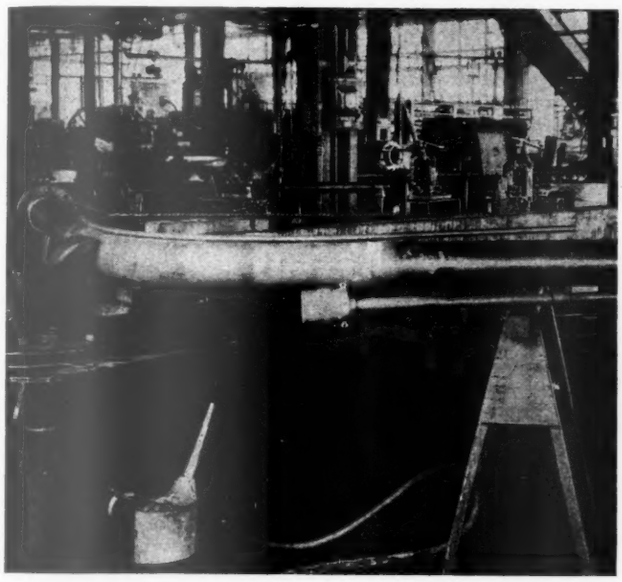
Details of the internal burner used in making large pipe bends



View showing the set-up for making a 30-in. radius bend in a piece of 5-in. standard pipe

on the end of the burner, providing a connection to the 1-in. supply pipe which also serves as a mixing chamber. This supply pipe is made in sections for greater convenience so that the length can be varied in accordance with the length of the large pipe to be bent.

The air supply is provided through a ¼-in. pipe from the shop air line with the pressure cut down to about 5 lb., as desired, by means of a square-head air cock. A shut-off valve is provided in the line just ahead of this air cock, which avoids the necessity of changing the



Close-up view of the large pipe bend with the burner removed to show its construction

adjustment each time the burner is shut off or started. The same arrangement is used on the gas line, which utilizes artificial gas at a pressure of 3 ounces.

To give the necessary flexibility in handling the burner and attached pipes, the air-line connection is made of a 15-ft. length of ½-in. rubber hose, and the gas connection comprises a similar length of 1-in. water hose.

The advantage of this burner is its relatively inexpensive operation and the fact that heat is applied to the pipe exactly where needed and the pipe can be progressively heated just the right distance ahead of the point where the last partial bend was made. With a little practice, any competent pipe fitter can produce a smooth bend in large pipe at a minimum expenditure of time and labor.

Holder for Centering Chalk

SOFT white crayon or stick chalk is, of course, the most practical for use about the lathe when setting and truing round work in the chuck. It does not usually last in one piece very long, however. Short pieces are not easy to handle and soon absorb grease and moisture from the fingers. Take an old fountain pen cap. With a bit of paper tighten a short piece of clean white chalk in it as shown. The fingers do no touch it and the

Centering-chalk holder

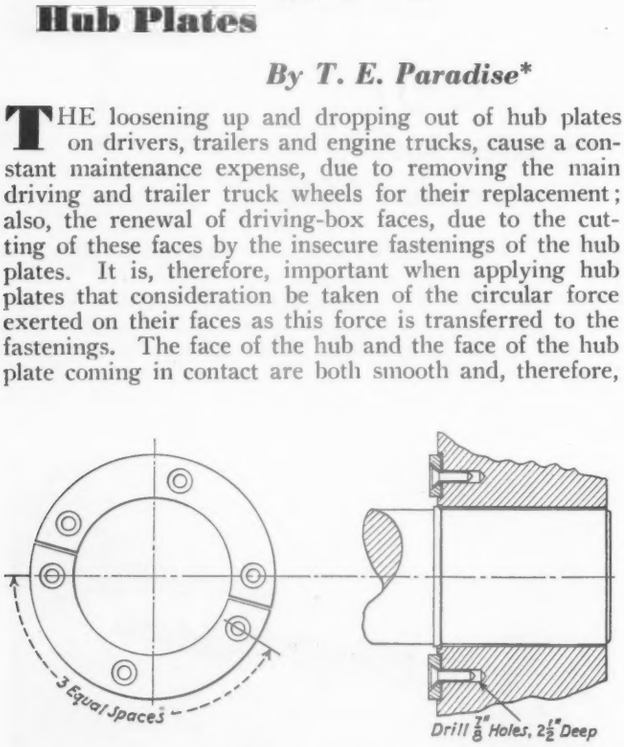
chalk is much easier to hold to a rapidly turning surface. Most of these caps have a pocket holder snap on them, or one can be easily attached. Keep the chalk point down in one of the handy breast pockets. It will always be convenient, clean and ready for use.

Operation of adjusting the internal burner as inserted in the pipe to be bent

Method of Applying Hub Plates

*By T. E. Paradise**

THE loosening up and dropping out of hub plates on drivers, trailers and engine trucks, cause a constant maintenance expense, due to removing the main driving and trailer truck wheels for their replacement; also, the renewal of driving-box faces, due to the cutting of these faces by the insecure fastenings of the hub plates. It is, therefore, important when applying hub plates that consideration be taken of the circular force exerted on their faces as this force is transferred to the fastenings. The face of the hub and the face of the hub plate coming in contact are both smooth and, therefore,

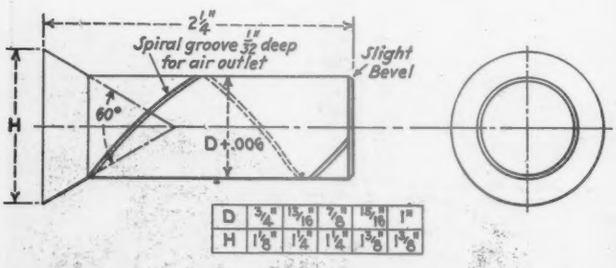


Method of holding hub plates securely in position by steel pins which are a drive fit in holes in the wheel center

cannot be relied upon to add any to the resisting force of the fastening which must be strong enough to keep the plate in position against the hub.

There are, at the present time, a great many methods used to hold hub plates in position. The following method gives good service and holds the hub plates in position against the hubs, preventing them from becoming loose, regardless of the service in which the locomotive is placed.

Referring to the illustration, the hub plate is turned to fit the counterbore in the wheel hub, as shown, and



Details of the mild-steel drive-fit pins used in applying hub wear plates

cut in two halves. It is then directly laid off from the hub by use of chalk applied to the hub hole, and lamp black on the hub face of the liner. The hub plate is then put in position and held, using a hammer to tap the exposed faces of the hub liner, thus marking the hub plate holes accurately. The holes are then drilled and countersunk with a tool that has a guide, making the countersink true with the drilled hole. It is important that the depth, diameter and taper of countersink be made to a gage.

Countersunk-head mild-steel pins are used as fastenings, with an allowance of .006 in. in diameter for a drive fit in the hub holes. These pins are manufactured on the turret lathe in standard sizes, and are kept in stock. They are not threaded, but depend upon the fit in the hub for holding the hub plate against the wheel face, also to hold the pins in. After these pins have been completed, before they are cut off in a turret lathe, a small circular groove is made, starting at the end approximately 1/32 in. deep and 1/32 in. wide, cut spirally around the pin with a 3/4-in. lead. This groove is made on the pin to prevent the accumulation of air in the hub at the end of the pin as it is being driven in.

To apply the hub plate, it is necessary to place the hub plate in position, and drive the plugs in with a sledge hammer and punch, or with an air hammer. An air hammer does the work very well, the pins being driven in until they are solid, drawing the hub plate against the hub. The heads of these pins should be at least 1/8 in. below the wearing surface of the hub plate. There should not be any riveting or chipping on these pins after they are driven in, as they should be made the proper length and have heads of the proper thickness. With this method of application, it is practically impossible for the hub plates to loosen up regardless of the friction on the faces.

Hub plates applied in the manner described will avoid the necessity of wheels being dropped for their renewal or any other reason, except excessive lateral.

* Master mechanic, Chicago, Burlington & Quincy, Alliance, Neb.

Reducing Lateral In Front-End Couplers

ONE railroad was experiencing a large number of derailments of cabooses when helper engines were used to help trains over grades. It developed that the cabooses were derailed after coming out of a curve onto

Reduced lateral in front coupler pockets prevented derailments caused by pusher locomotives

the straight track. In many cases the cause of the accident was attributed to the superstructure of the caboose being out of line or excessive end play in the journal bearings. A special inspector who was assigned to ride several of the cabooses while the helper engines were

coupled to them developed that the trouble was caused by excessive lateral between the side walls of the front-end or "bull-nose" casting and the side of the coupler stem together with the coupler pin hole being somewhat elongated in the front couplers of the helper engines.

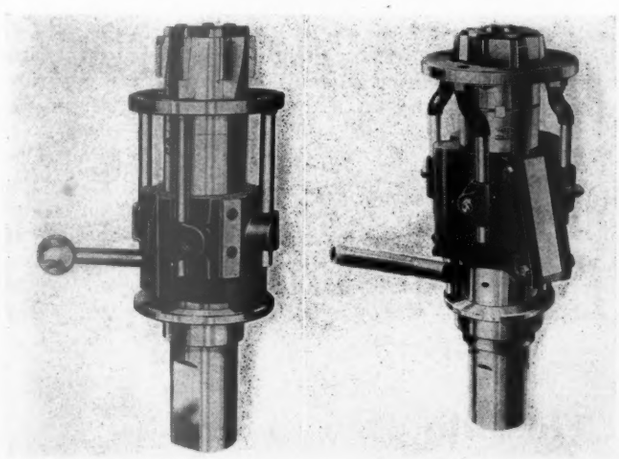
To overcome this condition instructions were issued for examination and rebushing of the coupler pin holes found worn in all front-end couplers at each form period. Also a 1¼-in. bar-iron plate was electrically welded to each side of the couplers on all helper engines as shown in the accompanying illustration. This reduced the lateral to one inch on each side of the coupler stem and has eliminated the derailments.

Due to the elongated condition of the coupler pin hole, when the engine was rounding a curve the coupler would move over to one side of the coupler casting and lock preventing it from straightening when straight track was reached.

Collapsible Taps for Straight and Taper Threads

THE Landis Machine Company, Waynesboro, Pa., has developed a new line of collapsible taps to supersede the Victor collapsible taps formerly manufactured by the Victor plant of this company. These new taps are made in two types—the Landis style LT, a collapsible tap for either straight or taper tappings, and the Landis style LM receding-chaser collapsible tap for taper tapping. They can be used either as stationary or rotary taps.

The outstanding feature of the new taps is a design whereby the tap consists of two units, a tap body containing the operating mechanisms and a tap head in which the chasers are supported. This arrangement offers many advantages since it permits the use of one tap body to cover a wide diametrical range by the application of tap heads of various sizes. In addition, the same tap body may be used for either right- or left-hand tapping, provided right- and left-hand tap heads are employed.



Landis collapsible taps, types LT and LM, for straight and taper threads

The collapsing mechanism is positive in its action, both with respect to locking the chasers in cutting position and in its collapsing action. The collapsing action is obtained through a hardened steel trip ring coming in contact with the part being tapped, thus insuring uniform thread length. The trip ring is adjustable for various thread lengths. The tap heads are adjustable for size by an adjusting screw located in the front end of the plunger. The screw is self-locking and is of the ratchet type so that a turn of the screw of one notch gives an adjustment to the chasers amounting to exactly 0.001 in.

The chasers are supported in slots in the tap head and are held securely in tapered seats in a hardened and ground plunger. The design of the plunger is such as to provide maximum rigidity for the chasers and at the same time there is no tendency for the plunger to rotate under cutting strains and thereby force the chasers out of alinement. All locating surfaces of the chasers, as well as the thread form itself, are precision ground.

Style LT collapsible taps are designed primarily for straight tapping, but can be used successfully for tapping tapered threads of a length not exceeding the American tapered pipe standards. Style LT taps are made in five sizes which, when equipped with the proper tap heads, cover a combined range from 1¼ in. to 13¼ in. inclusive. Style LM receding-chaser collapsible taps are designed for tapping tapered threads. The receding chaser action minimizes cutting strains on this class of work, with the result that greater accuracy and longer chaser life is obtained. Style LM taps are also made in five sizes covering a combined range from 1¼-in. to 12-in. pipe or 1½-in. to 13⅜-in. diameter.

Stationary Material Bins At Lathes

TO eliminate the necessity for lathe operators to leave their lathes or to run out of work at any time during their tour of duty a stationary material bin was installed at each lathe in a back shop. Various types of knuckle pins that require turning or bushings are delivered to the bins by material distributors at the direction of the machine-shop or general foreman and instructions are issued each day to the lathe operator as to the items he must turn out. After the material is completed by the lathe operator it is placed in the fin-

Bins for finished and unfinished work at the lathe

ished side of the bin and is collected by material distributors daily.

The bins are made from ¼-in. sheet steel, either riveted or welded together as shown in the accompanying illustration, and are of the size required for the various types of work which they are to contain.

This system not only eliminates the necessity for the lathe operator to leave his lathe but affords the shop foreman an opportunity of frequently inspecting the work turned out by each operator.

Tandem Main-Rod Lifting Device

A SOMEWHAT awkward operation in handling modern locomotive main rods of the tandem type is greatly facilitated by means of the device shown in the illustration. This device, which was developed at the Chicago shops of the Chicago & North Western and is now used quite extensively at other shop and enginehouse points on this road, consists of a ⅝-in. steel plate, 16 in. long by 12 in. wide, drilled with three holes, corresponding in position to the grease plug holes, in the tandem main rod. Suitable plugs, firmly screwed

Tandem main-rod handling device used on the C. & N. W.

into the grease plug holes, are provided with extensions on the upper ends which pass through the holes in the steel plate. The plate is then held tight by means of keys, as illustrated, or, in some cases, by threaded bolt and nut connections.

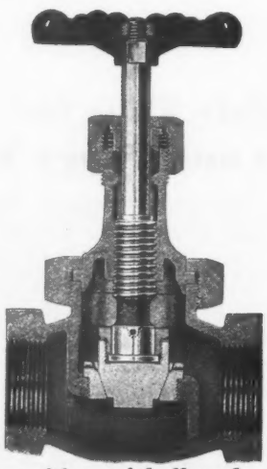
Since the two parts of the tandem main rod swivels on a steel bushing, it is obvious that the use of this plate to hold the grease plug holes in a fixed relationship will have the effect of holding both parts of the tandem main rod in practically a horizontal position, the rod then being handled easily and safely by means of the usual chain and hoist connections. The merits of this device will be readily appreciated by all shop or enginehouse men who have attempted to handle the heavy tandem main rods, which, without some such provision, have a tendency to "jack-knife" at the slightest provocation with consequent difficulty and, sometimes, danger in handling.

Plug-Type Renewable-Seat Valves

FOR severe service demanding maximum resistance to destructive action on valve-seat bearings the Lunkenheimer Company, Cincinnati, Ohio, has developed a new line of valves with plug-type NS5 alloy seats and discs which are known by the trade names Renewo and Ferrenewo.

NS5 alloy is a new and exclusive Lunkenheimer development which is said to be a non-galling, non-ferrous composition of great hardness (300 Brinell), resistant to wear, abrasion, erosion and corrosion, and retains its hardness at high temperatures.

These plug-type valves are made with full length,



Valves with special alloy plug and valve seat

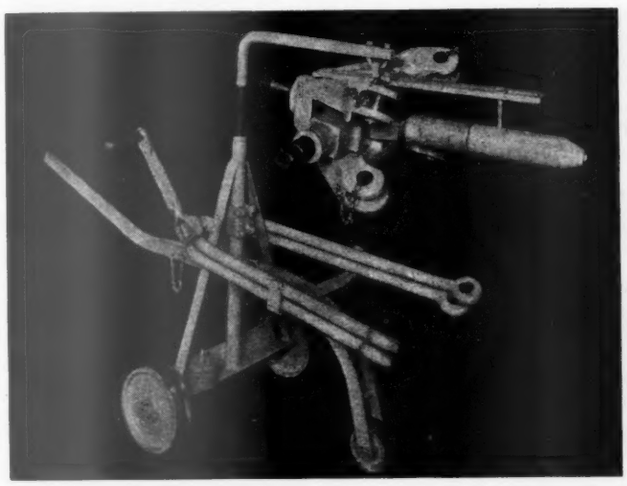
deep-seated plugs. Each plug is ground into its own seat to a uniform bearing from end to end, thus insuring a leak-proof fit. Iron-body bronze-mounted Ferrenewo plug-type valves are made for 150-lb. steam pressure, while the bronze Renewo valves are available in both 200 and 300-lb. steam pressure patterns. Excepting bodies and bonnet rings, all parts of Ferrenewo and medium Renewo valves are interchangeable; hence, it is necessary to carry but one stock of parts for both valves. This interchangeability feature likewise applies to the various patterns of extra-heavy Renewo valves.

Flexible Piston Parter

SEVERAL improvements and refinements have been incorporated recently in the design of the flexible piston parter made by Smith Devices, Philadelphia, Pa. The object of this device is the quick and easy separation of the locomotive piston rod from the crosshead without exertion of undue effort and with assurance against damage to either piston rod or crosshead. One of the illustrations shows the device as attached to the crosshead and the other the device ready for transportation to the locomotive. The one attached to the crosshead is of a somewhat older design than the one shown alone. By means of a light three-wheel goose-neck truck one man can easily move the device from the toolroom to the place where it is to be used. As will be noted the truck

carries all parts required, so that only one trip is necessary. The power portion is suspended on an arm which can be raised and lowered by the operating wrench to suit the crosshead height. Detachable U-bolts, which take the strain, are connected to the parter by pins and bear against the front of the crosshead boss above and below the piston-rod fit. By this arrangement no strains are placed on the body of the crosshead to damage it in any way.

After the U-bolts are in place the slack is taken up by a large central saddle screw. The parting of the rod



Improved Smith flexible piston parter

Smith piston parter set up and attached to locomotive crosshead

is then effected by the power or jacking device. This consists of a wedge, mounted between rollers, moved in and out by the detachable crank arm, and exerts a pressure on the plunger which bears against the end of the piston rod. By means of this device it is said that with a 20-in. leverage a pressure as high as 100 tons can be exerted. The flexible piston parter, which is made of alloy steel, heat treated, is available in two sizes. The No. 1 size handles all rods from the smallest to the largest, while the No. 2 size handles up to crossheads with a 4-in piston rod.

A similar device, equipped with four hooks, makes a very convenient tool for pulling pinions and gears, pulleys, etc. Such pullers or strongbacks are available in several sizes.

A Tool Tray For the Machine Shop

AT every lathe or machine in the machine shop there are numerous tools that must be kept on hand for use when needed. Unless some arrangement is provided for the machine operator to store these tools in a convenient place where they can be easily selected when required he is apt to store them under the machine, on

One side of the two-part tray is for good tools; the other is for tools needing grinding

shelves in the wall of the shop or keep them in his locker where they cannot be periodically inspected by himself or the foreman.

In addition to providing a stand for each machine operator one foreman arranged a tray to be kept on top of the stand for storing cutting tools. One side of the tray is painted red, in which the tools requiring dressing are placed by the operator and the other side is painted black, in which side the serviceable tools are kept.

Tools that require dressing are collected several times each day and dressed by a competent mechanic after which they are re-distributed to the various lathes or machines.

Among the Clubs and Associations

CANADIAN RAILWAY CLUB.—A. I. Lipetz, consulting engineer, American Locomotive Company, presented a paper on Recent Progress in the Development of the Steam Locomotive at the April 9 meeting of the Canadian Railway Club.

NEW ENGLAND RAILROAD CLUB.—A review of railway rolling stock, locomotives, passenger cars and freight-train cars, outlining the progress of their development and studying the relation of modern equipment types to the needs of the service, was presented at the April 10 meeting of the New England Railroad Club by L. K. Sillcox, vice-president, New York Air Brake Company.

CENTRAL RAILWAY CLUB OF BUFFALO.—Three papers were presented at the April 12 meeting of the Central Railway Club of Buffalo, also a special feature, "The Forgotten and the Known Railroad Men in Passenger Operation," which was presented by the male chorus of the club. The papers were: Air Conditioning of Passenger Cars, by Col. George H. Emerson, chief of motive power and equipment, Baltimore & Ohio; A Modern Ticket Office, by C. A. Thurber, city passenger agent, Lehigh Valley, and The Public's Viewpoint on Railroad Passenger Operation, by Maj. H. Morton Jones, vice-president and treasurer, R. T. Jones Lumber Company.

WESTERN RAILWAY CLUB.—Meeting held Monday evening, March 19, at the Hotel Sherman, Chicago. Subject "Air Conditioning of Passenger Cars," by A. R. Walker, electrical engineer of equipment, Illinois Central. ¶ This paper, which contained a considerable amount of information not previously published regarding air-conditioned passenger cars, was largely devoted to a discussion of factors involved in specifying air-conditioning equipment to meet particular operating requirements. After outlining the general principles of operation on the various methods of air-cooling, including ice, steam-ejector, electro-mechanical, and direct-mechanical, Mr. Walker stated that each system has its advantages and disadvantages and that, in order to make intelligent recommendations, it is necessary to develop all the facts regarding each proposed installation and decide which system will be the most economical and give the best results He called attention to the necessity for adequate power supply and said that, in addition to the electrical load, steam systems require approximately 270 lb. of steam per hour, whereas direct-mechanical systems impose an additional load of approximately 10 kw. per car, all of this power being supplied by the locomotive en route. ¶ The cost of supplying this power was calculated by Mr. Walker to be $.01888 per 100 lb. of steam and $.00833 per kw. hr. Using these figures and an average cost of $4 per ton for ice, Mr. Walker made an interesting comparison of the cost per hour of electric power, steam and ice for a 6-ton-capacity refrigerator system, as follows: Direct-mechanical system, $.08330; steam-ejector system, $.08015; ice system, $1.00833. In another comparison of a specific run of 294.3 miles, the power requirements and cost per car, assuming that cooling was required only 75 per cent of the time, were calculated for the three systems mentioned to be $.44, $.41 and $4.92, respectively. ¶ Mr. Walker stated that operating cost is not the only important consideration and that such items as generator capacity, weight, pre-cooling, reliability, maintenance, interchangeability and fixed charges must be given due weight. Mr. Walker concluded his paper as follows: "It might be well to point out that air-conditioning has been developed during a time when the railroads were less able than at any time in their history to finance any new development. There is no question as to the desirability or even the necessity for air conditioning, and the only thing that remains is to determine the most economical and satisfactory method, all factors considered."

Directory

The following list gives names of Secretaries, dates of next regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 2205, 150 Broadway, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—Division V.—MECHANICAL.—V. R. Hawthorn, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorn, Chicago.

DIVISION VI.—PURCHASE AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Columet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Marion B. Richardson, Room 332, 30 Church street, New York. Spring meeting, Denver, Colo., June 25-28.

MACHINE SHOP PRACTICE DIVISION.—R. E. W. Harrison, 6373 Beechmont avenue, Mt. Washington, Cincinnati, Ohio.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—Edgar J. Kates, 1350 Broadway, New York.

FUELS DIVISION.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month except June, July and August, La Salle Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth street, Council Bluffs, Iowa. Regular meetings, second Tuesday of each month at Council Bluffs.

CENTRAL RAILWAY CLUB OF BUFFALO.—M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month except June, July and August, at Hotel Statler, Buffalo.

CLEVELAND RAILWAY CLUB.—F. B. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meetings temporarily suspended.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. I Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—R. A. Singleton, 822 Big Four building, Indianapolis, Ind. Regular meetings first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m. Noon-day luncheon, 12:15 p. m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—T. D. Smith, 1660 Old Colony building, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabasha street, Winona, Minn.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September.

NEW YORK RAILROAD CLUB.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting first Monday each month, except June, July and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, R. F. D. 5, Peoria, Ill.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1941 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md. Annual meeting October 17-18, Hotel Stevens, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver buiding, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TORONTO RAILWAY CLUB.—N. A. Walford, district supervisor car service, Canadian National, Toronto, Ont. Meetings first Friday of each month except June, July and August.

TRAVELING ENGINEER'S ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—C. L. Emerson, 822 Straus Building, Chicago. Regular meetings third Monday in each month except June, July, August and September.

NEWS

THE DONNER-HANNA COKE CORPORATION has awarded a contract to the Pressed Steel Car Company for the rebuilding of 100 hopper cars of 70 tons capacity.

THE WESTERN MARYLAND has ordered 10 loco valve pilots from the Valve Pilot Corporation, New York. The ERIE recently placed an order with the same company for two valve pilots.

THE GREAT WESTERN ELECTRO-CHEMICAL COMPANY has ordered two class 105 tank cars of 30,000 lb. capacity from the General American Tank Car Corporation. These cars are to be used for the transportation of liquid chlorine.

THE ERIE has ordered eight all-steel combination passenger, baggage and mail cars from the American Car & Foundry Company. Inquiry for this equipment was reported in the March issue. Inquiry is being made for 50 bulk cement cars of 50 tons' capacity.

THE NORTHERN PACIFIC has placed an order with the Timken Roller Bearing Company, Canton, Ohio, for Timken bearings to be used on all axles, including driving axles, on 10 large class 4-8-4 high speed passenger locomotives recently ordered from the Baldwin Locomotive Works.

THE MISSOURI-KANSAS-TEXAS has just completed four new diners completely equipped with kitchen and pantry equipment of Enduro stainless steel, a product of the Republic Steel Corporation, Central Alloy division, Massillon, Ohio. The equipment was fabricated and installed by the M-K-T forces at the passenger car shops, Sedalia, Mo. Present plans call for four more diners of this type. In addition to these diners, three de luxe club cars with soda fountains and back bars of Enduro stainless steel are in service on M-K-T lines.

George H. Houston Heads Capital Goods Committee

AT THE GENERAL CONFERENCE of code authorities and code committees representing the various industries with the National Recovery Administration at Washington, called for the purpose of revising the various codes with a view to creating more employment, George H. Houston, president of the Baldwin Locomotive Works, was designated by Administrator Johnson as chairman of a committee representing the capital goods industries to present the views of those industries as to the general problem. Another committee was appointed to represent the consumer goods industries and both held conferences with General Johnson on March 8, after which they remained in Washington for further conferences. In addresses before the general conference both President Roosevelt and General Johnson urged the representatives of industry to adopt a plan for shortening hours of labor and increasing wages and General Johnson suggested a plan for a general 10 per cent reduction in hours and increase in wage rates. It was recognized that a uniform plan could not be applied for all industries and the efforts of the N. R. A. seemed to be exerted toward voluntary proposals from the industries.

Mr. Houston acted as chairman of a meeting at which a committee of fifteen

George H. Houston

was appointed and after the conference with Johnson issued the following statement of its general attitude:

"The solution of unemployment in the durable goods industries cannot be accomplished by a reduction of hours and increase of wages, inevitably followed by increased cost, with business volume so drastically reduced at this time," the statement said. "Purchase of durable goods diminishes rapidly with increasing price. Further curtailed demand for durable goods at this time would freeze unemployment now existing in this field for the indefinite future. Flexibility in hours of work as is possible under the codes is essential to the operation of the durable goods industry. This can only be accomplished in the face of conditions that will give security of principal and such rate of return as will encourage men to take the hazard of investment. The primary concern must be to restore those conditions that will cause the owners of capital to risk it in private enterprise and private enterprise again to undertake new ventures. To accomplish such a step, the amendment of the Securities Act of 1933 is necessary, as well as the rewriting of the proposed National Securities Exchange Act of 1934, so as to encourage the issuance and free exchange of industrial securities under reasonable and proper regulation without restriction of the capital needs of business."

Northern Pacific to Enlarge Enginehouses

PLANS ARE being made by the Northern Pacific for the expenditure of about $245,000 during the next few months for the enlarging of enginehouses and the strengthening of bridges on certain parts of its lines to permit these structures to accommodate 4-8-4 type locomotives, having a length of about 110 ft., of which 10 are now under construction for this company.

The program will involve the following work at enginehouses: St. Paul, extend five stalls to 130 ft., $30,000; Jamestown, extend four stalls to 135 ft., $25,000; Missoula, extend six stalls to 135 ft., $30,000; Parkwater (Spokane, Wash.), extend one stall to 130 ft., $5,000; Seattle, extend five stalls to 130 ft., and replace 85 ft. turntable with 115-ft. three-point support turntable, $75,000.

Railway Car Appliance Industry Organized for Code

IN ORDER to carry out the N. R. A. code of the railway car appliances industries, these companies have organized as the Railway Car Appliances Association, a division of the Fabricated Metals Products Manufacturing and Metal Finishing and Metal Coating Industries.

Officers are as follows: President, W.

Progress in Air-Conditioning Programs During Recent Weeks

Road	No. of cars	Type of car	Type of system	Builder
B. & O.	42	Pullman	Mech.	.....
	16	Coaches		
	41	Dining-lounge		
B. & M.	10	Coaches	Inquiries are being made for this equipment	
	10	Diners		
C. & N. W.	2	Lounge	Mech.	Melcher
C. M. St. P. & P.	22	Pass.	.....	To be installed in company shops
D. L. & W.	6	Diners	Ice	Safety Car Htg. & Ltg. Co.
	2	Buffet		
	1	Club		
	7	Pull. sleep.	Ice	.....
	7	Pull. parlor		
N. Y. N. H. & H.	57*	de luxe coaches	Freon	Safety Car Htg. & Ltg. Co.
	12*	Comb. de luxe coaches and baggage cars		
Sou. Pac.	6	Pull. club	Mech.	.....
	12	Pull. observa.		
	22	Pull. room		
	5	Diners	Mech.	P. C. & M. C.
	5	Diners	Ice	To be installed by road
	4	Observa.		
	7	Lounge		
	4	Club		
	2	Parlor		

*All of these cars will derive the necessary power for air-conditioning and lighting from 15-kw. safety generator equipments, using Dayton-Roderwald, cogbelt and gear, axle drives.

E. Sharp, president of the Grip Nut Company, Chicago; treasurer, Arthur A. Frank, vice-president of the Union Metals Products Company, Chicago; temporary secretary, William H. Winslow, Jr., an attorney; directors, in addition to Mr. Sharp and Mr. Frank, include, A. C. Moore, president, Chicago Railway Equipment Company, Chicago; W. D. Thompson, president, Hutchins Car Roofing Company, Detroit, Mich.; A. D. Bruce, vice-president and secretary, Vapor Car Heating & Lighting Company, Inc., Chicago; W. W. Darrow, vice-president, Camel Sales Company, Chicago; C. D. Jenks, president, Chicago Cleveland Car Roofing Company, Chicago; G. N. DeGuire, assistant to the president, Locomotive Firebox Company, New York; and J. P. McWilliams, president, Youngstown Steel Door Company, Cleveland, Ohio. The Code committee consists of Mr. Sharp, Mr. Moore and Mr. Thompson.

Members of the association are as follows: Ajax Hand Brake Company, Chicago Cleveland Car Roofing Company, Camel Sales Company, Chicago Railway Equipment Company, O. C. Duryea Corporation, Evans Products Company, Enterprise Railway Equipment Company, Grip Nut Company, Gustin-Bacon Manufacturing Company, Gold Car Heating & Lighting Company, Hutchins Car Roofing Company, Illinois Railway Equipment Company, W. H. Miner Company, P. H. Murphy Company, Railway Metal Products Company, Roth Manufacturing Company, Standard Car Truck Company, Standard Railway Equipment Company, Safety Car Heating & Lighting Company, Union Metal Products Company, Union Railway Equipment Company, Vapor Car Heating & Lighting Company, Inc., Western Railway Equipment Company, Youngstown Steel Door Company, Railway Devices Company, Camel Company and Lumber Products Company.

Orders for Locomotive Firebox Company's Syphons

THE LOCOMOTIVE FIREBOX COMPANY has received orders for 40 Nicholson thermic syphons for fifteen 2-8-4 freight locomotives and five 0-8-0 switching locomotives now under construction for the New York, Chicago & St. Louis. Two syphons will be applied to each firebox. Orders for eight syphons received from England have added two new foreign railroads to the list of syphon users outside of the United States. Two syphons are to be installed in each of three XD class locomotives being built by the Vulcan Foundry, Ltd., for the South Indian Railways. One set of two syphons has been ordered for the Peruvian Corporation. All of these syphons will be manufactured in England by Beyer, Peacock and Company. Inquiries have been received from the Peiping Liaoning Railway in China for two sets of two syphons. The Lehigh Valley has inquired for five sets of three firebox and one combustion chamber syphons and the Delaware, Lackawanna & Western for 20 sets of two firebox and one combustion chamber syphons. The Chicago, Milwaukee, St. Paul & Pacific has inquired for 30 sets of two firebox and one combustion chamber syphons. All of these inquiries are in connection with proposed new 4-8-4 type locomotives.

P. W. A. Loans

DURING the past month the following progress has been made in P. W. A. negotiations:

Baltimore & Ohio.—A contract for a loan of $4,500,000 has been signed which will enable the B. & O. to spend $5,484,406 this year in giving additional employment to its track and shop forces and purchasing materials, including 49,000 tons of rails and fastenings; the construction of 820 fifty-ton steel gondola cars, at an estimated cost of $1,145,244, heavy repairs to 4,800 freight cars, $1,923,000; reconstruction of 200 automobile box cars, $134,000; and reconditioning 240 locomotives, $1,078,000. $984,406 of the $5,484,406 is funds of the B. & O.

Boston & Maine.—A contract has been signed covering a loan of $2,230,000 for rails and fastenings and a contract for a loan of $2,628,000 for new equipment is in the course of preparation. Details concerning the equipment to be purchased are given in the March issue. Inquiry is being made for the de luxe seats in 10 passenger coaches and for air-conditioning equipment for four dining cars.

Central of Georgia.—The allotment to the C. of Ga. has been increased from $500,000 to $600,000 for 200 70-ton coal cars instead of 50-ton cars.

Chicago Great Western.—An allotment of $1,200,000 has been made for the purchase of 500 box cars.

Chicago, Milwaukee, St. Paul & Pacific.—A contract has been signed covering a loan of $2,317,000, of which $136,000 will be used to install air-conditioning equipment in 22 passenger coaches and $114,531 to equip 300 automobile cars with patented loading devices. The remainder of the $2,317,000 will be spent for rail and fastenings. A contract for $1,716,000 for building the 75 new passenger-train cars listed in the March issue has also been signed.

Delaware, Lackawanna & Western.—In its report approving the proposed expenditure by the D. L. & W. of $4,666,000 for the purchase and reconstruction of equipment the Interstate Commerce Commission stated that a protest had been received from a vice-president of the Brotherhood of Locomotive Firemen and Enginemen against "approval of a loan" for the purchase of five oil-electric locomotives on the ground that the company's steam locomotives were adequate for its service and that the installation of the oil-electric locomotives would result in the furlough of firemen and engineers. The commission stated, however, that this raised a question bearing on the propriety of making the loan, which was not for its determination, and that its function was only to determine the desirability of the change in motive power as an improvement of transportation facilities.

Erie.—A contract has been signed for a loan of $2,671,000 to be used to purchase rail and fastenings and rebuild 750 freight cars. $623,000 will be spent for converting the 750 cars from drop-bottom gondolas into self-clearing hopper cars in the company's shops at Dunmore, Pa. This is the second loan contract with the Erie to be signed by Administrator Ickes, the first covering a loan of $11,282,000 for purchasing 3,775 new freight cars and 133 new passenger train cars.

Fort Smith & Western.—An allotment of $75,000 has been made to the receiver of this road for repairs to 170 freight cars and track and road work.

Great Northern.—A contract for an allotment of $4,935,000 to this road has been signed. Of this amount $669,500 will be used for classified repairs to 316 locomotives; $674,000 for repairing 6,374 freight cars; $484,000 for reconditioning and rebuilding 138 passenger cars, including air-conditioning of 6 dining cars. The remainder of the allotment will be used for the renewal or improvement of bridges and buildings, work on right-of-way, etc.

Gulf, Mobile & Northern.—I. C. C. approval has been asked for the expenditure of $1,000,000 by this road for the purchase of 150 box cars, 50 gondolas, 4 motor cars with 600-hp. Diesel engines, 2 passenger coaches and 2 observation sleeping cars.

Midland Continental.—This road, which was allotted a loan of $40,000 to be used in the purchase of a Diesel-electric locomotive, has applied to the Interstate Commerce Commission for an amended authorization of the proposed expenditure to permit it to purchase such a locomotive from the Westinghouse Electric & Manufacturing Company at a cost of $52,000, in place of one on which it had received bids.

Illinois Central.—The I. C. C. certificate to the Illinois Central has been modified so as to approve of a change in plans. Instead of using $65,000 for ties and $183,100 for labor for applying new material and surfacing track the company proposes to purchase 248,100 ties at $1 each and instead of $6,210,555 for repairs to freight cars it proposes to spend only $5,210,555 for this purpose and to make repairs to locomotives at a cost of $1,000,000.

Lehigh Valley.—Two payments totaling $888,000 have been made on the loan of $2,000,000 to this road reported in the January issue. The five new locomotives, for which a loan of $600,000 was reported in the March issue, are to be built by the Baldwin Locomotive Works. The original request for these locomotives was for $500,000.

New York, New Haven & Hartford.—The New Haven has applied to the I. C. C. for approval of the expenditure of its allotment of $2,300,000 for the purchase of 50 passenger coaches, 2 steel passenger trailers, and 2 car units equipped with Diesel-electric motive power. An order for 50 passenger cars has been placed with the Pullman-Bradley Car Corporation. An additional $300,000 has been allotted for a four-car, high-speed streamlined train, including two cars with Diesel motors.

Pennsylvania.—Checks totaling $17,379,000 have now been sent to this road, in the following amounts: $6,990,000; $9,760,000 and $629,000.

Pittsburgh & West Virginia.—The loan of $331,000, for which a contract has now been signed, will be used for the purchase of three 2-6-6-4 Mallet type locomotives under construction by the Baldwin Locomotive Works.

Savannah & Atlanta.—An allotment of $250,000 to the receiver of this road will be used for the purchase of 100 new box cars.

Seaboard Air Line.—The receivers of the Seaboard Air Line have applied for a loan of $3,000,000 to $3,500,000 and have applied to the Interstate Commerce Commission for authority for the expenditure for the purchase of 5 locomotives, 1,000 fifty-ton steel box cars, and 100 phosphate cars. Inquiries have been placed for the box cars and for five 2-6-6-4 Mallet type locomotives.

Among the roads applying for or receiving allotments for the purchase of rail, track fastenings, etc., are the Grand Trunk Western, $250,000; Great Northern, $1,305,000; Kansas, Oklahoma & Gulf, $255,000; Main Central, $313,000; New York Central, $400,000; New York, Ontario & Western, $235,000. The N. Y. C. will apply for a further loan of approximately $2,200,000 for rail purchases and work incident thereto.

Supply Trade Notes

HAROLD S. RUSSELL, 332 South Michigan avenue, Chicago, has been appointed representative for the Schaefer Equipment Company, Pittsburgh, Pa.

JOSEPH SINKLER, INC., 122 South Michigan avenue, Chicago, has been organized by Joseph Sinkler, formerly general manager of the Pilot Packing Company, Inc., to sell railway supplies.

J. CLAY LEE, assistant manager of the railway sales division of the Standard Oil Company of Indiana, has been appointed manager of the division with headquarters at Chicago.

RALPH G. CAULLEY has joined the Detroit, Mich., district sales office of Republic Steel Corporation, Youngstown, Ohio. Mr. Caulley had been connected with the Wheeling Steel Corporation for 14 years, the last seven of which were spent in the Detroit district.

AHRENS & RICHARDSON, 30 Church street, New York, in addition to other accounts, have been given exclusive charge of sales in the eastern territory for the Foster-Johnson Reamer Company, Elkhart, Ind., handling a full line of reamers for air-brake maintenance and repairs.

THE ROSS AND WHITE COMPANY, Chicago, has concluded a contract agreement with the owners of the patents for the railroad rights in locomotive coaling plants of the Adams withdrawal and mixing chute. This chute is designed to mix large and

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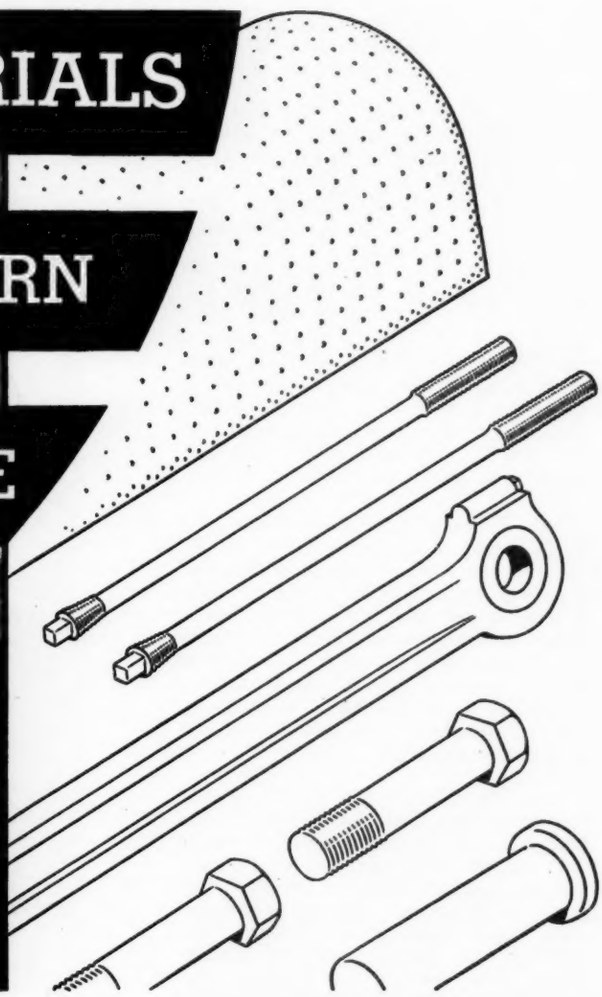
MODERN MATERIALS .... MAKE MODERN DESIGNS POSSIBLE



Lightweight, stream-lined equipment has focused attention on the importance of new and improved materials in modern railroading. • • • Less spectacular but equally important has been the influence of improved materials on standard equipment. • • • Cars have had their life prolonged by repairing with corrosion-resisting Toncan Iron sheets. • • • Fireboxes have been given the protection of special alloy irons and steels, resulting in longer service between shoppings. • • • Staybolts have greater fatigue resistance, thanks to Agathon Nickel Iron. Non-stretching Agathon engine bolt steel has also kept equipment out of the shop. • • • These are only a few examples of the many special materials developed by Republic metallurgists to help the railroads attain greater reliability of performance and lower maintenance costs. • • • Consult Republic on your materials problems.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

Toncan Iron Boiler Tubes, Pipe, Plates, Culverts, Rivets, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Maney Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.

The Birdsboro Steel Foundry & Machine Company of Birdsboro, Pa. has manufactured and is prepared to supply under license, Toncan Copper Molybdenum Iron castings for locomotives.

AGATHON NICKEL IRON

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

TONCAN IRON

fine coals in passing to locomotive tenders. The Ross and White Company also secured railway sales rights for the Blackhall railroad car washing machine.

W. M. STEVENSON, for the past four years district representative of the Crucible Steel Company of America, at Rockford, Ill., has been transferred to the railway department of that company, with headquarters at 1258 East Fifty-fifth street, Cleveland, Ohio.

THE SAFETY CAR HEATING & LIGHTING COMPANY will move its executive offices about April 14 from 75 West Street to 230 Park avenue, New York City. Arthur B. Mills, sales representative of the Safety Car Heating & Lighting Company at Boston, Mass., has been appointed manager of the New England sales district with headquarters as heretofore at Boston.

THE RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY, Port Chester, N. Y., has acquired from the American Marsden Company, Jersey City, N. J., the sole manufacturing and sales rights in the United States of the Marsden locknut. A Marsden locknut division has been created at Port Chester. C. E. S. Place, formerly chief engineer of the Marsden Company, now is associated with Russell, Burdsall & Ward in this connection.

THE LOCAL INTERESTS of the Pacific Car & Foundry Company, Seattle, Wash., have acquired the stock control formerly held by the American Car & Foundry Company in that company. Officers of the re-organized company are now as follows: Paul Pigott, president; H. N. Curd, vice-president and general manager; William Pigott, vice-president and treasurer and W. S. Bassage, secretary and assistant treasurer.

C. L. SHEEN, district sales manager of the American Locomotive Company and the Railway Steel-Spring Company at San Francisco, Cal., has been promoted to a position in the St. Louis, Mo., office. Mr. Sheen has been connected with the American Locomotive Company in various positions for the past 14 years and for the past seven years has been located on the Pacific coast Marshall D. Raymond has been appointed district sales manager of the American Locomotive Company and the Railway Steel-Spring Company in San Francisco. Mr. Raymond was previously connected with the New York and St. Louis offices.

WILLIAM H. WINTERROWD, vice-president of the Lima Locomotive Works, Inc., has resigned to become a vice-president of the Franklin Railway Supply Company, assuming the duties heretofore carried on by vice-president J. L. Randolph, who has resigned. Mr. Winterrowd's headquarters will be in Chicago. Mr. Winterrowd was born April 2, 1884, at Hope, Ind. He attended the high school at Shelbyville, Ind., and was graduated from Purdue University in 1907. During his summer college vacations he worked as a locomotive wiper on the Missouri Pacific, blacksmith helper on the Lake Erie & Western (now the New York, Chicago & St. Louis) at Lima, Ohio, and as a car and air brake repairman on the Pennsylvania Lines West of Pittsburgh, at Dennison, Ohio. After graduation he became a special apprentice on the Lake Shore & Michigan Southern, following which he was enginehouse foreman on the Lake Erie, Alliance & Wheeling (now New York Central); night enginehouse foreman on the Lake Shore & Michigan Southern, at Youngstown, Ohio, and roundhouse foreman on that road at Cleveland. In 1910 he became assistant to the mechanical engineer of the Lake Shore & Michigan Southern; in 1912 mechanical engineer of the Canadian Pacific, and in 1918 chief mechanical engineer of

William H. Winterrowd

that road. In 1923 he became assistant to the president of the Lima Locomotive Works, Incorporated. Three years later, in 1926, he was appointed vice-president of that company. Mr. Winterrowd accompanied Sir George Bury to Russia in 1917 to assist in compiling a report for the Russian government on its transportation system, and was in that country during the Kerensky revolution. He was president of the Canadian Railway Club in 1920-21. He has served as a member of the publication committee of the American Society of Mechanical Engineers and was chairman of that committee in 1932. He has taken an active interest in the Railroad Division of The American Society of Mechanical Engineers and is now chairman of its program and papers committee. Before leaving railroad service he was a member of the General Committee of the Mechanical Division of the A. R. A.

FREDERICK A. GEIER, president of the Cincinnati Milling Machine Company, died suddenly at his home in Cincinnati, Ohio, on March 27. Mr. Geier was born in Cincinnati on June 23, 1866. He had been engaged in manufacturing machinery since 1887 and had been president also of the Cincinnati Rubber Manufacturing Company, Factory Power Company, and Factory Colony Company. He was a director in many organizations, including the Cincinnati-Bickford Tool Company, the Cincinnati Rubber Manufacturing Company, and the Ohio Mechanics Institute. He held memberships in numerous clubs and associations, among them the National Society for the Promotion of Industrial Education and the American Society of Mechanical Engineers. In 1901 he helped organize the National Metal Trades Association and in 1910-11 was president of the National Machine Tool Builders' Association.

Personal Mention

General

D. WALLACE FISHER has been appointed superintendent of the Reading Transportation Company, highway subsidiary of the Reading, with headquarters at Philadelphia, Pa. Mr. Fisher was born at Manheim, Pa., on November 29, 1893. He was graduated from Stevens Technical School at Lancaster, Pa., in 1910. After serving

D. Wallace Fisher

for several years as a tool maker for the Hamilton Watch Company, he was employed for two years as an automotive mechanic. In 1916 he entered the service of the Reading as a machinist in the locomotive shops at Reading, Pa., later being transferred to the office of the mechanical engineer as draftsman. In 1919 Mr. Fisher was appointed motive power inspector, being advanced to the position of assistant mechanical engineer in 1922. Mr. Fisher was appointed assistant superintendent of the Reading Transportation Company in April, 1928, and served in that position continuously until his recent promotion.

Purchasing and Stores

LORNE KILMER, assistant general storekeeper of the Grand Trunk Western, has been promoted to general storekeeper, with headquarters at Battle Creek, Mich., succeeding J. C. Jackson, deceased.

ARTHUR J. NEAULT, assistant general purchasing agent of the Chicago & North Western, with headquarters at Chicago, has been appointed to succeed John Ball, assistant general purchasing agent, deceased.

A. A. TAYLOR, assistant to the general purchasing agent of the Missouri Pacific Lines at St. Louis, Mo., has been promoted

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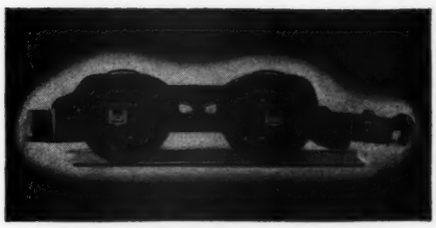
MAINTENANCE *is a part of* POWER COST

by *Lowering* MAINTENANCE
The LOCOMOTIVE BOOSTER
produces Power
at a LOWER COST



If a locomotive cylinder must be made large to give the needed power at low speeds it is too big for road speeds. Because the big cylinder is used continously there is no chance to cut down on the work done and hence cut down on maintenance. You are still paying the full maintenance whether or not you are working to capacity.

But if the locomotive is designed to employ a combination of a smaller cylinder plus The Locomotive Booster to secure the equivalent power at low speeds, the Booster power can be cut out as speed increases and the smaller cylinders will then carry the load. Smaller cylinders naturally mean lower maintenance due to a reduction in the amount of work done.

Take full advantage of all the economies of The Locomotive Booster and incorporate it in the original design.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.
NEW YORK CHICAGO MONTREAL

to the newly-created position of assistant general purchasing agent with headquarters at St. Louis.

WILLIAM S. MOREHEAD, who has been appointed general storekeeper of the Illinois Central, has been connected with this company for 32 years. Mr. Morehead was born at Bowling Green, Ky., and entered the service of the Illinois Central in 1902, in the office of the roadmaster at Water Valley, Miss. Two years later he was sent to New Orleans, La., as chief clerk to the roadmaster, being transferred to Nashville, Tenn., in 1905. Mr. Morehead was appointed assistant chief clerk to the superintendent at McComb, Miss., in June, 1907, and in the following year he was promoted to the position of division store-

William S. Morehead

keeper at the same point. In 1913 he became assistant general storekeeper at Memphis, Tenn., being transferred to Chicago in 1917 where he remained until his promotion to general storekeeper.

Obituary

WILLIAM DAVIDSON, general storekeeper of the Illinois Central, who died on February 22 had been connected with the Illinois Central for 41 years. He was born

William Davidson

on March 16, 1874, at Selma, Ala., and after a public school and business college education he worked for two years for the United Gas & Improvement Company at Vicksburg, Miss. In 1893 he entered railway service as a car repairer on the Illinois Central at Vicksburg and later served successively as master car builder clerk, wheel clerk, storekeeper, file clerk, assistant timekeeper, general timekeeper, accountant, storekeeper and assistant chief clerk to the master mechanic. On June 1, 1908, Mr. Davidson was promoted to the position of division storekeeper at Vicksburg, and on May 1, 1910, he became assistant general storekeeper at Chicago. He was appointed general storekeeper of the Illinois Central System at Chicago on May 1, 1917. Mr. Davidson had been active in the affairs of the Purchases and Stores Division, American Railway Association, for many years and served as chairman of that division in 1929.

J. H. THORUP, who retired in 1926 as local storekeeper of the Chicago & North Western at Chicago, died on March 22 at Chicago, at the age of 77 years.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

TRIPLE DIE STEEL.—Cromovan triple die steel is described in a four-page illustrated folder issued by the Firth-Sterling Steel Company, McKeesport, Pa.

GRINDERS.—The Monarch Machine Tool Company, Sidney, Ohio, has issued a new two-color catalog which pictures and describes in detail its new Precision toolroom surface grinder.

CRANK-PIN GRINDER. — The Micro portable locomotive crank-pin grinder is illustrated and described in Bulletin 105 issued by the Micro Corporation, Bettendorf, Iowa.

FORGING MACHINES.—"What Is a Modern Forging Machine?" is the title of a 27-page illustrated booklet issued by The National Machinery Company, Tiffin, Ohio. The construction of the National high duty forging machine is described in detail.

RIVERSIDE PRODUCTS. — The Riverside Metal Company, Riverside, N. J., has issued booklets on nickel silver, phosphor bronze, and Beryllium copper, which metals are available in rods, wire, sheets, strip, bars and blanks for a diversity of applications.

SPOT AND PROJECTION WELDING EQUIPMENT.—A new line of spot and projection welding equipment for manual or motor operation is described in an illustrated leaflet issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

UNION COLD-FINISHED SHAFTING.—The physical properties, straightness, warpage, etc., of Union Cold-Finished Shafting are discussed in a 16-page illustrated booklet issued by the Union Drawn Steel Company, Massillon, Ohio. A four-page bulletin has also been prepared on Union Cold drawn steels.

INTERNAL COMBUSTION ENGINE FUEL.—Under the title "A New and Better Fuel for Internal Combustion Engines," the Philgas Company, General Motors Building, Detroit, Mich., has issued bulletin No. 38 which describes the advantages of liquefied petroleum gases, such as butane and propane, for general use as a motor fuel. The bulletin describes the block testing of engines operated with this type of fuel and used for large stationary engines, pumping and generator engines, power rail car engines, and other applications.

MACHINE GAS CUTTING.—Facts about the machine gas-cutting process and the machines themselves have been compiled in an attractive 92-page booklet issued by the Air Reduction Sales Company, Lincoln building, New York. Numerous illustrations show the range and scope of machine cutting, and separate chapters are devoted to details concerning the Airco-D-B radiagraph, camograph, omnigraph, tramograph, oxygraph, and travograph.

ELECTRICAL EQUIPMENT FOR RAILROADS.—A 60-page circular, No. 1966, entitled "Electrical Equipment for Railroad Shops and Maintenance of Way," has been issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It is divided into four sections: Part I, Opportunities for Reducing Operating Costs by Electrical Modernization; Part II, Equipment for Electrical Modernization; Part III, Service, Repairs, Renewal Parts, and Part IV, Index to Westinghouse Products for Steam Railroads.

THERMIT WELDING.—"Thermit Welding —Industry's Master Maintenance Tool," is the title of an illustrated booklet published by the Metal & Thermit Corporation, 120 Broadway, New York. The booklet describes Thermit welding, an alumino-thermic process which has been successfully employed for more than 30 years in the welding of heavy sections of ferrous metals. The actual welding of railroad track and the repair of large parts, crankshafts, and similar articles by the Thermit Process are also covered. Actual cost data are given in a number of instances.

LATHES.—A 72-page general catalog, No. 94, showing the complete line of South Bend lathes and attachments for repair shops, equipment and instrument maintenance shops, experimental laboratories and general machine shops, has just been issued by the South Bend Lathe Works, 426 East Madison street, South Bend, Ind. The catalog describes and prices 96 sizes and types of lathes, all of the back-geared, screw-cutting type, ranging from small bench lathes up through the medium sizes to large swing lathes. A new line added to this general catalog is the underneath belt motor-driven lathe.